BIOLOGY

Paper – 1

(THEORY)

(Botany and Zoology)

Three hours and a quarter

(The first 15 minutes of the examination are for reading the paper only.

Candidates must NOT start writing during this time).

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*Answer **all** questions in Part I and* **five** *questions from Part II, choosing* **three** *questions from Section A and* **two** *questions from Section B.*

All workings, including rough work, should be done on the same sheet as, and adjacent to; the rest of the answer.

The intended marks for questions are given in brackets [ ].

PART I (40 marks)

*Answer **all** questions.*

Question 1.

(a) Read the following questions carefully. For each question there are four alternatives A, B, C and D. Choose the correct alternative and write it in your answer sheet. **[5]**

(i) Roots and shoots lengthen through the activity of the

A apical meristem.

B lateral meristem.

C vascular cambium.

D interfascicular cambium.

(ii) Which one of the following elements is present in chlorophyll?

A manganese

B magnesium

C copper

D iron

(iii) Which hormone will be deficient, if both the ovaries of a female are removed?

A gonadotrophic

B oestrogen

C oxytocin

D prolactin

(iv) During expiration, the shape of the diaphragm is

A straightened.

B contracted.

C flattened.

D arched.

(v) Haploid plantlets can be produced by

A endosperm culture.

B meristem culture.

C embryo culture.

D pollen culture.

(b) Complete the following statements by choosing the correct words from the list given in brackets. Write the correct answers in your answer scripts without copying the whole sentence.

[4]

(*xylem fibers, sublingual glands, xylem parenchyma, epithelial, high, gastric gland, negative, positive, xylem vessels, intestinal glands, connective)*

(i) …….. is the only living element of xylem tissue.

(ii) The tissue that forms the inner lining of blood vessels is ……..

(iii) When the tugor pressure is …….., the diffusion pressure deficit becomes more than the osmotic potential.

(iv) Saccus entericus is the secretion of ……..

(c) Correct the following statements by changing one of the underlined words only. Rewrite the correct statements. [5]

(i) During <u>dark</u> reaction of photosynthesis <u>water</u> is reduced to organic compounds.

(ii) The structural changes in chromosomes occur due to error during <u>mitotic</u> division which lead to <u>phenotypic</u> changes.

(iii) The cardiac phase during which both atria and ventricles are <u>relaxed</u> is called joint <u>systole</u>.

(iv) <u>High</u> level estrogen and progesterone stimulate secretion of follicle stimulating hormone and leuteinizing hormone from the <u>anterior</u> pituitary to initiate next ovarian cycle.

(v) Formation of ATP in the chloroplast in the <u>presence</u> of light is called <u>oxidative phosphorylation</u>.

(d) Match each item in Column A with the most appropriate item in Column B. Rewrite the correct matching pairs in your answer sheet. **[5]**

Column A	**Column B**
(i) Sieve tubes	a. xylem
(ii) White fibrous tissues	b. ovule
(iii) Vasa rectae	c. Z-band
(iv) Megasporangium	d. collagen fibres
(v) Actin filament	e. micturition
	f. counter-current mechanism
	g. phloem
	h. I-band

(e) Name the scientists associated with the following. **[2]**

(i) DNA finger printing

(ii) Discovery of penicillin

(iii) Revised recapitulation theory

(iv) Adaptive radiation through study of finches

(f) ***Study the relationship between the first two terms and accordingly complete the second relationship.*** **[4]**

(i) Ethylene: abscission: : …… : apical dominance.

(ii) Chemotactic: chemicals: : thermotactic : ……

(iii) Perennials: shoot senescence: : Temperate deciduous : ……

(iv) Epigeal germination: elongation of hypocotyl: : Hypogeal germination : ..…

(v) Alpha cells: glucagon: : Beta cells : ……

(vi) Children: cretinism: : Adults : ……

(vii) Red blood corpuscles: haemoglobin: : Red muscle fibers : ……

(viii) Hinge joint: knee: : Metacarpal: ……

(g) ***Give reasons for the following.*** **[5]**

(i) Photorespiration occurs only in C_3 plants.

(ii) When apical bud is removed, the next axial bud begins to grow.

(iii) Plants of the legume family usually contain more protein than other plants.

(iv) Luteal phase of the menstrual cycle is also called the secretory phase.

(v) Myopia is corrected using a concave lens.

(h) ***Answer the following.*** **[6]**

(i) Why do farmers grow leguminous crops and plough them back in the field?

(ii) Why does a dry bean seed fail to germinate?

(iii) A plant kept under short-day condition flowers when the dark period is interrupted by a flash of light. Why is it a long-day plant?

(iv) Why does one hear ‘lubb’ and ‘dubb’ in quick successions?

(v) Why does the hyposecretion of parathormone cause hypocalcemia?

(vi) What is synaptic delay?

(i) ***Give scientific terms for the following.***

(i) Vegetative propagation of plants through tissue culture techniques.

(ii) Occurrence of more than one embryo in an orange seed.

(iii) Occurrence of two or more forms of a character in the individuals of a deer population.

(iv) Birth of a human baby with power of moving ear pinna.

(j) ***Mention one significant difference between each of the following pairs.*** **[2]**

(i) Kwashiorkar and marasmus

(ii) Uremia and kidney stone

PART II

SECTION A (30 marks)

Answer any three questions.

Question 2.

(a) Point out ***three*** differences between intrafascicular cambium and interfascicular cambium. **[3]**

(b) How does the nerve impulse travel in a myelinated nerve fiber? Explain with the help of a sketch diagram. **[3]**

(c) (i) Explain the role of pancreas in the digestion of fats. **[2]**

(ii) Protein hydrolyzing enzymes are secreted as proenzymes. Why? Name any such ***two*** enzymes. **[2]**

Question 3.

(a) (i) Distinguish between first maturation division and second maturation division of the phase of spermatogenesis. **[2]**

(ii) What do you understand by oogenesis? **[1]**

(b) (i) Explain any ***one*** internal factor that influences the process of photosynthesis. **[1]**

(ii) Draw a schematic diagram to show the pathway of electrons during cyclic photophosphorylation. **[3]**

(c) How does haemoglobin act as a buffer? **[3]**

Question 4.

(a) What are the changes observed during the following phases of growth? cell formation, cell enlargement and cell differentiation **[3]**

(b) (i) What do you understand by anti-transpirants? Name any ***two*** types. **[2]**

(ii) State stepwise the changes in the stoma of a leaf when exposed to light as per active potassium ion (K^+) transport mechanism. **[3]**

(c) How are supinators and pronators antagonistic to each other? **[2]**

Question 5.

(a) (i) How does counter-current mechanism in the loop of Henle help in concentrating the urine? **[3]**

(ii) What are uricotelic organisms? **[1]**

(b) Potato is cultivated vegetatively. Mention any ***three*** advantages and ***three*** disadvantages of this method. **[3]**

(c) In excessive bleeding, blood clotting prevents death of a person. Explain the mechanism of blood clotting. **[3]**

Question 6.

(a) Mention any ***two*** deficiency symptoms of calcium and zinc. **[2]**

(b) Define day neutral plants. Give ***two*** examples. **[2]**

(c) (i) Draw a well labelled schematic diagram to show feedback mechanism in thyroxine homeostasis. **[2]**

(ii) Why is the pancreas said to be heterocrine gland? **[2]**

(d) Distinguish between calcined bone and decalcified bone. **[2]**

SECTION B (30 marks)

Answer any two questions.

Question 7.

(a) (i) Briefly describe the experiment carried out by Spallanzani. What did he conclude from this experiment? **[3]**

(ii) Distinguish between phylogenetic and serial homology with an example each. **[2]**

(b) (i) Outline Lamarck's theory of inheritance of acquired characters. **[3]**

(ii) List ***three*** evidences in favour of mutation theory. **[3]**

(c) (i) What do you understand by animal hybridization? Name any ***two*** improved cattle variety introduced in Bhutan. **[2]**

(ii) Practice of artificial insemination is advantageous over direct introduction of improved varieties of animals. Justify giving ***two*** points. **[2]**

Question 8.

(a) (i) What do you understand by allopatric and sympatric speciation? Explain giving an example in each case. **[3]**

(ii) State the evolution of modern giraffe as per Darwin's theory. **[3]**

(b) (i) What do you mean by interferons? **[1]**

(ii) Give ***three*** distinguishing features between primary and secondary immune responses. **[3]**

(c) (i) Define a biomedical technique used to solve a paternity dispute. **[1]**

(ii) Differentiate the working principle of an electrocardiograph (ECG) and an electroencephalograph (EEG). **[3]**

(d) List ***two*** modes of transmission of HIV from mother to child. **[1]**

Question 9.

(a) (i) Draw schematic diagrams to represent the process of deletion and duplication. **[3]**

(ii) Define physical mutagen. Give ***two*** examples. **[2]**

(b) (i) 'Society's attitude towards mental illness should change to help mentally ill people recover'. Support the statement by explaining psychotherapy and rehabilitation. **[3]**

(ii) Why is the supply of safe drinking water important for a healthy community? **[1]**

(c) (i) It is risky to bear a baby of a Rh positive man by a Rh negative woman. Explain. **[2]**

(ii) State the events that occur during an allergy. **[2]**

(d) The growth and vigor of a pine tree decreases if it fails to form ectomycorrhizal association. Explain. **[2]**

Question 10.

(a) (i) Name the bacterium used in the manufacture of vinegar. Name the ***two*** major steps involved in the manufacture of vinegar. **[3]**

(ii) What do you mean by single-cell protein (SCP)? **[1]**

(b) Mention ***three*** reptilian and avian characters possessed by *Archaeopteryx lithographica* which proves that it is a missing link between the reptiles and birds. **[3]**

(c) Answer the following:

(i) Integrated pest management involves various pest control methods. Mention any ***four*** such methods. **[2]**

(ii) How can the use of biogas in developing countries help solve the problems of fuel as well as manure shortage? **[2]**

(iii) Genetically modified crops are being developed for various improved characters. List any ***four*** improved characteristics in GM crops. **[2]**

(iv) What do you mean by cancer? Mention the ***two*** types of tumors. **[2]**