Part A - Structured Essay

1. (A) (i) State the function of each of the following proteins.

(a) Serum albumin : .....

(b) Ovalbumin : .....

(ii) (a) Why are amino acids considered as amphoteric molecules?

(b) State two differences between animal fats and plant fats.

(iii) (a) Name a protein with alpha helix structure, which is a component of intermediate filaments of the animal cytoskeleton.

(b) Name a compound present in the cell walls of both bacteria and cyanobacteria but not in the cell walls of archaebacteria.

(iv) (a) What acts as the object for the eyepiece lens when a specimen is observed through a compound light microscope?

(b) What is used to stain specimens for observation through the transmission electron microscope?

(v) State two functions carried out by both rough and smooth endoplasmic reticulums and two functions carried out only by smooth endoplasmic reticulum (SER).

(a) By both : .....

.....

(b) By SER only : .....

.....

.....

.....

(B) (i) Name the most abundant glycoprotein in the extracellular matrix of animal cells.

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(ii) (a) Name the subcellular component that carries out each of the following activities in cells.

Transporting residue material out of the cell : .....

Cytoplasmic streaming : .....

(b) Which organelle in plant cells is involved in the formation of the cell plate during cytokinesis?

(iii) During which phase of mitosis are the chromosomes located at the middle of the cell?

(iv) Name two cell types in the human body that are at G_0 phase.

(v) (a) State the precise site at which each of the following is carried out during cellular respiration.

Breakdown of glucose to pyruvate : .....

Production of oxaloacetate : .....

(b) Name the final hydrogen acceptor in each of the following.

Ethyl alcohol fermentation : .....

Lactic acid fermentation : .....

(C) (i) (a) State what is meant by cofactors of enzymes.

(b) Name two inorganic coractors.

(ii) (a) How does ADP carry out allosteric regulation or an enzyme?

03 pts

(b) Name a solution that can be used as an indicator to demonstrate amylase activity on starch.

01 pt

(iii) (a) Where are the photosystems located in chloroplasts?

01 pt

(b) State the wave lengths of light absorbed by chlorophyll-a molecules in photosystem I and photosystem II.

Photosystem I : .....

Photosystem II : .....

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(iv) State three ways by which the cyclic electron flow differs from the linear electron flow in the light reaction of photosynthesis.

(v) Photosynthetic plants were highly abundant in the Phanerozoic eon. Name the three eras of the Phanerozoic eon.

2. (A) (i) State five features of organisms of domain Eukarya that are common to all or some organisms of domain Archaea.

(ii) State three substances other than cellulose that are present in the cell walls of some protists and name an organism/group of organisms that contains each of these substances.

Substance	Organism/Group of organisms

(iii) What are the structures that form the ovule of seed plants?

(iv) State five characteristic features of phylum Nematoda that can be observed when a specimen of *Ascaris* (round worm) is examined externally.

(B) (i) State two functions of hair like trichomes.

(ii) What form the symplastic route of radial transport in plants?

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(iii) What is the form of intake of sulphur into plants?

(iv) Why do land plants carry out internal fertilization?

(v) What are known as statoliths that help to detect gravity by vascular plants?

(C) (i) State the structural features of a skeletal muscle tissue that can be observed under the light microscope.

(ii) State the functions performed by tongue in the nutrition of humans.

(iii) Using a labelled diagram, indicate the direction of blood flow in the single circulation of fish.

(iv) How do the fluids and proteins lost during capillary exchange of substances return to blood in humans?

(v) (a) Indicate the correct pathway through which erythrocytes in the inferior vena cava reach the aorta.

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(b) Why have respiratory pigments evolved in complex animals?

3. (A) (i) (a) Why are respiratory structures needed for animals?

(b) State the difference between the vital capacity and total lung capacity of humans.

(ii) Name two types of 'antigen presenting cells' in humans.

(iii) (a) State the advantage of excreting nitrogenous waste as ammonia for many aquatic invertebrates.

(b) What is the process by which most water is reabsorbed in the nephrons of humans?

(c) State the location at which the nephridia of annelids open internally.

Coelom

(iv) (a) What is chronic kidney disease?

(b) Name the endocrine disorder that would lead to kidney failure in humans.

(v) (a) State how the nervous system of arthropods is organised.

(b) From which part of the human embryonic brain does each of the following structures originate?

Pons Varolii : .....

Pineal body : .....

(B) (i) (a) Where are the nerve cell bodies located in the cerebrum of man?

(b) Write in correct sequence, the pathway of transmission of impulses in a typical reflex arc in man.

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(c) Name the disorder of the human nervous system that is associated with distorted perception of reality.

01 pt

(ii) (a) State the arrangement of cells in the human retina starting from the innermost cell layer.

(b) How is a single image perceived in binocular vision in humans?

(iii) What is perceived as sound in hearing?

(iv) (a) What is an endocrine gland?

(b) State the reasons for hypothyroidism in humans.

(v) (a) How does luteinizing hormone promote spermatogenesis in man?

(b) What are the main structural changes that occur in the uterus of a mature, normal woman during the uterine cycle in preparation for the arrival of fertilised ovum?

(C) (i) (a) Name the two hormones responsible for the preparation of uterus for receiving the fertilised ovum.

(b) What is the foetal membrane associated with the development of urinary bladder in humans?

(ii) Name a sexually transmitted infection in man caused by a virus other than HIV.

(iii) (a) Name a group of animals that move by taking water into the body and squirting it out in bursts.

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(b) What is the role of Ca^{2+} in shortening of sarcomeres in the skeletal muscles?

(iv) (a) State the functions of sinuses in the human skull.

(b) What is the structural arrangement in the upper limb of human which permits power grip?

(c) Name the joint that bears the body weight of the human when standing.

(v) (a) What is a gene?

(b) What is known as mutation breeding in crop plants?

4. (A) (i) Nucleotide sequence of a part of a DNA coding strand for a polypeptide and relevant amino acids are given in diagram X.

(a) Name the types of specific point mutations if nucleotide sequence of X is altered due to substitution as shown in diagrams Y and Z.

X : CGTTTTTTACCTATA
Arg Phe Leu Pro Ile

Y : CGTTTTTCACCTATA
Arg Phe Ser Pro Ile

Z : CGTTTTTTGCCTATA
Arg Phe Leu Pro Ile

Y : .....

Z : .....

(b) Write the mRNA nucleotide sequence corresponding to the part of the DNA coding strand given in X.

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(ii) (a) What is meant by vector in gene technology?

(b) Give two examples for cloning vectors.

(iii) Why is recycling of materials in an ecosystem important?

(iv) Name three biomes where the temperature reaches 35°C or above.

(v) (a) What is meant by ethical value of biodiversity?

(b) What is the purpose of Kyoto protocol?

(B) (i) State the specific physical method that can be used to sterilize each of the following.

(a) Hospital waste : .....

(b) Air in operating theatres : .....

(c) Enzyme solutions with microbial cells larger than 0.45 µm :

.....

(d) Inoculation loops : .....

(ii) Name a chemoautotrophic bacterial genus that oxidises NO_2^- to NO_3^- in soil.

(iii) State two modes of respiration present in both mycoplasma and unicellular protists.

(iv) Name a simple stain used to observe the cellular shape of bacteria.

(v) If a student is provided with two sets of petri dishes with sterile solidified nutrient agar and a phenol solution, write in correct sequence the procedure that should be followed to test the effect of phenol on microorganisms in air.

(C) (i) (a) What is the role of methanotroph microorganisms present in oceans?

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(b) How are mycorrhizae beneficial to plants?

(ii) (a) Name two species of genetically modified microorganisms used to produce human insulin.

(b) State the cause for algal blooms seen in some freshwater bodies.

(iii) (a) Why is activated carbon used in some drinking water treatment plants?

(b) What does the presence of coliform bacteria in drinking water indicate?

(iv) (a) Name a type of microorganism that cause spoilage of each of the following foods.

Food stored at 4°C : .....

Food containing sugar : .....

(b) How does *Aspergillus flavus* cause food intoxication in humans?

(v) State two uses of nano device sensors in nanomedicine.

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உயிரியல் II
Biology II

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Part B - Essay

Instructions:

* *Answer **four** questions only.*
  Give clear labelled diagrams where necessary.
  *(Each question carries **150** marks.)*

5. (a) Describe the transcription process in polypeptide synthesis of eukaryotes.

(b) Explain the structure of the plasma membrane of a living cell.

6. Describe the defence mechanisms shown by plants against pests and pathogens.

7. (a) Briefly describe the role of liver in human nutrition.

(b) Explain how digestion is regulated in man.

8. (a) Briefly describe separately the major changes that take place in the human foetus during second and third trimesters of pregnancy.

(b) Explain modern reproductive technology that can be used in resolving infertility problems in humans.

9. (a) Explain the Darwin-Wallace theory of evolution.

(b) Briefly discuss the factors that contribute for global warming.

10. Write short notes on the following.

(a) Human sex linked characteristics

(b) Prions

(c) Applications of stem cells

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