



13 ශ්‍රේණිය - තෙවන වාර පරීක්ෂණය - 2025
Third Term Test - Grade 13 - 2025

ජීව විද්‍යාව
Biology

09

S

I,II

පිළිතුරු පත්‍රය
Answer Paper

Part - A

01. A. i. a. Parentage testing / criminal investigations / To solve immigration disputes.
b. - DNA fingerprinting
- ii. a. Always a purine base pairs with a specific pyrimidine base
b. In DNA Adenine pairs with Thyamin RNA Adenine pairs with Uracil.
- iii. Sub cellular component - Ribosome
Function = Carryout protein synthesis (polypeptide)
- iv. • binding of Small subunit of ribosome to - mRNA
• and to the initiator tRNA.
• tRNA carries methionine as the 1st amino acid
• Then 2 sub units of the ribosome combine to form the functional ribosome.
- v. a. Golgi apparatus
b. Cytoskeleton
c. Microtubules and proteoms
dynamic / has the ability to break and reform as needed.
- B. i. DNA & protein complex which organized inside the nucleus
- ii. Get condense → Prophase
Less condense → Telophase
- iii. a. The abnormal cells remain at the original site the lump
b. When a single cell in a tissue undergoes transformation / by that converts a normal cell.
- iv. a. It can carry energy to anywhere in the cell for can any energy consuming reaction.
b. In bioluminescence.
In muscle contraction
- v. a. A graph showing the effectiveness of different wave lengths of photosynthesis
b, Chlorophyll a is more effective for blue and red light.
Chlorophyll b and carotenoids are effective in absorption of specific range wavelength. of corresponding to different colours

- C. i. a. RuBP oxygenase reaction
 b. • 3-PGA production reduce by 50% instead of RuBP carboxylase reaction.
- ii. • Correct orientation of the molecules.
 • The tight fit brings the substrate molecules and the active site close to each other. (forming the enzyme complex)
- iii. a. Protein → Amino acid
 Amino acid $\xrightarrow{-NH_3}$ Pyruvate / Acety COA / citric acid cycle
 b. • Photosynthetic rate → Audus micro burette
 • Respiratory rate → Respirometer
 stages of meiosis → *Tradiscantra*
- iv. a. • Organisms aquire characteristics during their life time as adaptations to their environment and
 • Pass those characteristics to the next generation.
 b. The taxonomic unit at any level / rank of the hierarchy
- v. a. use of morphological criteria to distinguish species such as shape and other structural features.
 b. Methanococcus
 Production of bio gas.

02. A. i. a. - Generic name & specific epithet.
 b. - Multicellular gametangia
 - Dependent embryo
 - Apical meristem

ii.

Gelidium

1. Photosynthetic pigments: chlorophyll a, d and phycobili proteins
2. Stored food: Floridean starch
3. Gas-filled bulb shape floats: absent
4. Cell wall: cellulose

Sargassum

1. Photosynthetic pigments: chlorophyll a, c and xanthophyll
2. Stored food: Laminarin
3. Gas-filled bulb shape floats: present
4. Cell wall: cellulose and alginic acid

iii – Lycophyta

- iv. a. Because they are transported directly through the pollen tube.
 b. - All angiospermae plants
 - Most of gymnospermae plants.
- v. - Produce flowers
 - Triploid endosperm
 - Double fertilization
 - Seeds are enclosed in fruit
 - Production of fruit
 - Presence of sieve tube elements & companion cells.

- B. i. a. root cap
 b. Auxin
 c. • High concentration inhibits the cell elongation of the root.
 • Promote cell division in the root.
 • Branch which arises horizontally aise

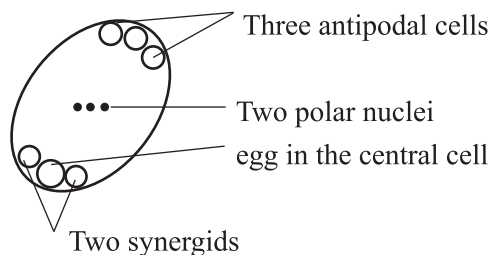
- ii. - allows passing of nutrients more freely.
- allows movement of fluid from one sieve element to the next.
- iii. a. Vascular cambium
Cork cambium
b. Cork cambium and tissues it produces are collectively called Periderm.
- iv. Monocots → Parallel
Dicots → Reticulate
- v. The physical property that predicts the direction in which water will flow, governed by solute concentration and applied pressure.

- C. i. a. Guttation.
b. *Alocasia*, *Colocasia*

ii. Element	Forms of intake	Function
P	H_2PO_4^- , HPO_4^{2-}	Component of ATP & nucleic acid & phospholipids
N	NO_3^- , NH_4^+	Component of amino acids, proteins, nucleotides, nucleic acid, chlorophyll, coenzyme & enzymes

- iii. *Nephrolepis*, *Cycas*

- iv. a. - Due to shuffling of genes within a species,
- it produces new genetic combinations.
- Resulting increased genetic variation within the species.
- Important for survival and leads to evolution.
- b. Absorption of water
Activation of enzymes
Mobilization of food resources (nutrients)
Rapid growth process of embryo



- 03. A. i. a. They can be synthesized within the body from organic precursor molecules.
b. Any except Leucine and Methionine.
- ii. - Fructose: Facilitated diffusion
- Amino acid: Actively transported
- Water: Osmosis
- iii. a. organic compounds required in small amounts for maintenance of normal health and metabolism?
b. Vitamin: Vitamin K mineral F (Fluorine)
- iv) a. - Dissolved ions in the plasma in the blood
- Albumin in the plasma
b. Heparin

Complement protein

- B. i, a, Complement proteins

- B. i. a. Complement proteins
 b. Small accessible portion of an antigen that binds to a specific antigen receptor of T cells or B-lymphocytes is called an epitope. There are several antigen epitopes in a single antigen, each can bind with a specific antigen receptor of T lymphocytes.
- ii. a. Exaggerated responses of the body to certain antigens (allergens) are called Allergies
 b. Pollens
 Dust
 Some food (e.g., cuttlefish, prawn)
 Some antibiotics (Penicillin)
 Venom from honey bees and wasps
- iii. a. Because such substances may not be entirely filtered due to the short time & they remain in the glomerulus.
 b. Actively secreted - H^+
 Passively secreted - NH_3
- iv. a. Motor system
 Autonomic nervous system
 b. Due to progressive and irreversible degeneration of neurons in the brain cerebral cortex functioning, especially with deteriorating mental functioning.
- v. a. PTH - Parathyroid hormone
 Calcitonin
 b. Trophoblast

- C. i. a. Alleles separate and pair up independently during the formation of gametes.
 b. • To genes located on different chromosomes (non-homologous chromosomes)
 • To genes located far apart on the same chromosomes

ii.

$$\begin{array}{lcl}
 pp yy RR & = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} & = \frac{1}{64} \\
 pp yy Rr & = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{2} & = \frac{1}{32} \\
 Pp yy rr & = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} & = \frac{1}{64} \\
 Pp yy Rr & = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{2} & = \frac{1}{32} \\
 pp Yy rr & = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} & = \frac{1}{64} \\
 pp Yy Rr & = \frac{1}{4} \times \frac{1}{2} \times \frac{1}{4} & = \frac{1}{32} \\
 Pp Yy rr & = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} & = \frac{1}{64}
 \end{array}
 \left. \begin{array}{l} \\ \\ \\ \\ \\ \\ \end{array} \right\} \begin{array}{l} \\ \\ \\ \\ \\ \\ \end{array} \frac{1}{2} \times 7 \text{ P}^t \text{ (3.5)}$$

$$\frac{1}{64} + \frac{1}{32} + \frac{1}{64} + \frac{1}{32} + \frac{1}{64} + \frac{1}{32} + \frac{1}{64} = \frac{10}{64} \rightarrow \frac{5}{32} \text{ P}^t$$

$$\underbrace{\hspace{10em}}_{\frac{1}{2} \text{ P}^t} \quad \nwarrow \quad 1 \text{ P}^t$$

- iii. A ---- Ef B --- FF / Ff C --- FF / Ff D --- Ff

04. A. i. A collection of communities as well as the abiotic factors which they interact
- ii. a. Large grazers such as horses.
 burrowing mammals.
- b. • Inland fresh water wetlands
 • Coastal wetlands
 • Man-made wetlands

- iii. a. Genes, Species and eco-systems of direct indirect or potential use to humanity
 - b. Carbondioxide fixation through photosynthesis Maintaining of essential nutrients cycles.
Maintaining the water cycle and recharging groundwater
Soil formation and protection from erosion
Regulating climate by recycling moisture into the atmosphere
Water purification
Pollination
 - iv. Kothalahimbuty, Ebony (Kaluwara)
 - v. a. Increase in the average temperature of the Earth's surface due to the enhanced greenhouse effect.
 - b. CO_2
- B. i.
 - Simple nutritional requirements are sufficient for their growth.
 - They are able to convert (metabolize) a wide range of raw materials.
 - They are able to convert cheap raw materials into industrially important products.
 - Due to higher growth rate, they can convert raw materials into products within a short period of time.
 - Their growth conditions can be controlled to obtain desired end products.
 - Processes can be carried out at low temperatures and pressures compared to conventional industrial methods.
 - They give higher yield with higher specificity when compared to conventional industrial methods.
 - Microbes are amenable to genetic manipulation to obtain desired yield and quality with high efficiency.
- ii. • Remediate soil and water contaminated with oil spills, toxic metal waste, hazardous organic waste etc. decompose waster water from food processing and chemical plants,
- iii. a. • *Pseudomonas* / *Bacillus* / *Agrobacterium*
- b. • Fungi filaments
• Actinomycetes filaments
• Bacteria (which produce polysaccharide gums)
- iv. a. • Coliforms
- b. • Aerobic or facultative anaerobic
• Gram-negative
• Non-endospore forming
• Rod-shaped
• Ferment lactose to form gas within 48 hours in lactose broth medium
- v. Botulism - *Clostridium botulinum*
Cholera - *Vibrio cholera*
Aflatoxin - *Aspergillus flavus*
- C. i.
- ii. a. Growing crops under controlled environmental conditions.
- b. Bell pepper, Tomato, Salad cucumber, Lettuce, Cauliflower
- iii. - Provide physical support for the explant
- Increase the aeration of the medium
- iv. a. *Wuchereria*, *bancrofti*
- b. - Integrated vector management including:
 - Environmental control methods
 - Chemical control methods
 - Biological control methods
- v. a. nano-formulated liposomes
- b. Improved diagnosis of various diseases
 - Identifications of mutations linked to different forms of cancer
 - gene therapy and control system for drugs
 - study human evolution
 - anthropology

Part B - Essay

05) a. There are 4 Levels of structures

1. Primary Structure
2. Secondary Structure
3. Tertiary Structure
4. Quaternary Structure
5. The unique sequence of linearly arranged amino acid
6. Linked by peptide bonds is the primary Structure
7. Primary Structure of a single polypeptide chain coil and folds
8. As a result of intra molecular hydrogen bonds.
9. between the oxygen atoms of the carboxyl groups
10. and hydrogen atoms of the amino groups
11. of the same polypeptide chain backbone, to form the Secondary Structure
12. Alpha helix
13. eg:- Keratin
14. β pleated sheet - eg:- spider's silk fiber
15. Usually the Secondary polypeptide chain bonds and folds extensively forming
16. a precise compact unique, functional and three - dimensional shape resulting
17. Interactions between the side chain / R - group of amino acid
18. H - bonds
19. Disulphide bonds
20. Ionic bonds
21. Hydrophobic interactions
22. Vander Waals interactions
23. eg :- most of the enzymes/ myoglobin / albumin
24. Aggregation of two or more polypeptide
25. Separate chains are called protein subunits which were held together by inter and
26. intra molecular interactions
27. eg :- Hemoglobin, collagen

b. Protein digestion occurred in small intestine

1. Trypsin
2. Chymotrypsin
3. Catalyze the conversion of small polypeptides
4. into small polypeptides
5. These smaller polypeptides are converted into small polypeptides
6. Amino acid
7. By the Catalytic action of pancreatic Carboxypeptidases.
8. Dipeptidase
9. Carboxypeptidase
10. Aminopeptidase
11. Catalyze the conversion of small peptides into amino acids

} If there is ' Protease '
 give 1 point

$$27 + 11 = 38$$

$$38 \times 4 = 152$$

Max. 150

06) a. Mechanism of phloem translocation

1. Translocation of sugar is to transport or load into sieve tube elements
2. In some species it moves from mesophyll cells to sieve tube elements
3. Via symplast
4. Passing through plasmodesmata
5. Sinks usually receive sugar from nearest sugar sources
6. By active transport
7. because sucrose is more concentrated in sieve tube elements and companion cells than mesophyll cells.

8. Means against the concentration gradient
9. Due to loading of sugar into sieve tube reduces water potential inside the sieve tube elements at the source
10. This causes the sieve tube to take up water
11. from the xylem
12. by osmosis
13. This uptake of water generates a positive pressure
14. that forces the sap to flow along the tube
15. Unloading of sugar is at the sink end of the sieve tube.
16. The concentration of free sugar in the sink is always lower
17. Than in the sieve tube
18. As a result of Concentration gradient
19. Sugar molecules diffuse from phloem to sink
20. And water follows by osmosis
21. Phloem sap moves from source to sink by bulk flow
22. driven by positive pressure known as pressure flow

- b.
1. Water is brought to the leaf in the xylem of vascular bundle
 2. subsequently spread
 3. from a fine branch network throughout the leaf
 4. These branches end in one or few xylem vessels or tracheids
 5. Possessing little lignification
 6. Therefore water can release easily to mesophylls
 7. through their cellulose walls to
 8. water moves by apoplast, symplast and transmembrane pathway
 9. through the mesophyll cells
 10. according to water potential gradient
 11. Then water evaporates from the wet walls of the mesophyll cells
 12. into the intercellular air space
 13. Particularly into substomatal air space
 14. From here (stomata) water vapour
 15. Immediately next to the leaf is the thin layer of stationary air
 16. Each stomata has a diffusion gradient
 17. diffusion shell around it
 18. diffuse out and swap away by moving air

22 + 18 = 40
any 38 point
Max. 150

07 a. Structure of the cerebrum

Cerebrum is the largest part of the human brain
It is divided by a deep cleft
into right and left cerebral hemispheres
The superficial part of the cerebrum
composed of nerve cell bodies / gray matter
forming the cerebral cortex
Deeper layers consist of nerve fibers / white matter
The two cerebral hemispheres are connected by corpus callosum
Which is a mass of white matter.
The cerebral cortex shows many foldings
The cortex of each cerebral hemisphere is divided into 4 lobes
Frontal lobe
Temporal lobe
Parietal lobe
Occipital lobe
Three main functional areas of the cerebral cortex
Sensory area
Association area
Motor area

b. Mechanism of transmission of nerve impulses through chemical synapses

An action potential at an axon terminal

2. depolarizes the plasma membrane of presynaptic cell
3. Depolarization at the presynaptic terminal causes Ca^{2+} to diffuse in to the terminal
4. The rise in Ca^{2+}
5. Causes binding of synaptic vesicles containing neurotransmitters to the presynaptic membrane
6. This results in the release of the neurotransmitters into synaptic cleft
7. Neurotransmitters diffuse across synaptic cleft
8. Neurotransmitters bind and activate
9. Specific receptors in the postsynaptic cell membrane
10. eg :- Acetylcholine
11. the binding of neurotransmitters to the postsynaptic membrane allows Na^{+} and K^{+} to diffuse across the postsynaptic membrane
12. depolarization takes place in the postsynaptic membrane
13. it reaches the action potential
14. After passing the nerve impulse to the postsynaptic cell
15. the signal is terminated either by
16. Enzymatic hydrolysis of neurotransmitters
17. Recapture of neurotransmitters into the presynaptic terminals.

19 + 17 = 36
36 x 4 = 144
diagram 06
Total 150

08. a.

The female gonads are the 2 ovaries and they are found on either side of the uterus and are held in place in the abdominal cavity by ligaments

The ovaries have 2 tissue layers

Outer the cortex

and inner the medulla

The outer layer of each ovary consists of connective tissue

Covered by germinal epithelium

The outer layer contains ovarian follicles in various stages of maturity

Each follicle consists of an oocyte

Which is a partially developed egg

Surrounded by support cells

Support cells protect the oocyte

Human ovum is a round ball after the

Ruptured follicle

Corpus luteum

Fibrous corpus albicans are present

There are blood vessels present in the medulla

a. Process of drinking water treatment

There are 3 main steps in an urban water treatment plant

2. Sedimentation and coagulation
3. Filtration
4. Disinfection
5. If water is turbid, water is allowed to stand in a holding tank
6. for period of time
7. to allow settling down of particles suspended in water
8. Large particulate matter settles in the bottom
9. Sedimentation is enhanced by adding alum and aluminium potassium sulphate
10. Which produces a sticky precipitate
11. Many micro-organisms as well as
12. Finely suspended matter are removed by filtration

13. Removes protozoan cysts and
14. other micro - organisms
15. By passing through beds of fine sands
16. This removes 99% of Bacteria
17. Some urban treatment plants additionally use Activated carbon
18. for the removal of toxic chemicals in disinfection
19. Chlorination is one of the most common method
20. It kills pathogenic bacteria
21. By O₃ kills microorganisms by oxidation

$$17 + 21 = 38$$

$$38 \times 4 = 152$$

Max. 150

09. a.

1. One nucleotide pair is replaced by another pair.
2. There is no change in the length of the gene
3. Because the same amino acid may be coded by more than one codon
4. Some substitutions are silent mutations
5. Substitution of one pair of gene may not have an effect on polypeptide it codes for
6. The third letter in the codon triplet
7. has a wobble / 3rd letter of codon is replaced by another letter / the same amino acid is coded in the 3rd letter
8. A Substitution may also change one amino acid in the polypeptide
9. Therefore the meaning of the primary structure of the polypeptide is changed slightly
10. these mutations are missense mutations
11. This Substitution of the amino acid with another amino acid may
12. Or may not have significant impact on
13. the tertiary structure
14. Or quaternary structure of the proteins
15. This may render the protein a higher activity
16. Or even with new properties
17. Very often, these changes are either neutral or detrimental
18. Making the protein useless or less efficient
19. It is also possible that a point mutation convert a codon coding for an amino acid to a stop codon

$$22 + 14 = 36$$

$$36 \times 4 = 144$$

sarcomere diagram 06

Total 150

b. Structure of the sarcomere

1. Sarcomeres are the repeating contractile units present within a striated muscle cell
2. The sarcomere is composed of myofibrils
3. Containing contractile - thick filament and thin filaments
4. Which are made up of specific proteins
5. Thin filaments formed mainly from actin protein
6. Attached at the Z - line a dense strip which forms borders of the Sarcomere.
7. The thick filaments formed from myosin protein
8. Are fixed at the M line
9. in the middle region of the sarcomere.
10. Sarcomeres are found repeatedly between two Z lines in a skeletal muscle cell
11. At the edge of the sarcomere, there are only thin filaments
12. At the center of the thick filaments are present
13. Such arrangement of thick and thin filaments in the sarcomeres.
14. Permits the shortening of the skeletal muscle cell

10 a. Hot - air sterilization

Micro - organisms are killed by oxidation

2. Items to be sterilized are heated to about 1700 °C
3. and maintain for 2 hours

4. in a dry air oven
5. Sterilize glassware
6. Such a petri plates , flasks beakers
7. bottles and pipettes

b. Inbreeding

The breeding among genetically similar individuals are known as inbreeding

2. Among plant breeders the term inbreeding is commonly used to mean self - fertilization
3. This is done to produce an inbred variety
4. Which is exactly the same generation after generation
5. Wheat, Oats, Barley and bacco are produced from seeds which are hebitually self - fertilized
6. In animal breeding the term inbreeding is used to refer to the mating of closely related individuals
7. Inbreeding brings uniformity of required type
8. While preserving the desired characters
9. Inbreeding is used for devoloping pure lines in agriculture
10. Inbreeding increases homozygosis
11. Thus exposes harmful nessesive genes which would have stay hidden among heterzygotes
12. Continued inbreeding reduces genetic fitness of the population
13. As a result growth & fertility of the inbred population go down
14. With adversed effect on their productivity
15. Prevalance of genetic disorden might also increase among the inbred population
16. This phenomenon of having a reduced genetic fitness in a given population.
17. as a result of inbreeding is called 'Inbreeding depression'
18. Offsprings that are exhibiting the desired trait , without other negetive ones
19. The negatively affected individuals in the progeny are removed or are not ne allowed to be bred
20. inbreeding is used in agriculture to help accumulation of super genes.

C. Warning signs

Serving abdominal pain

2. Persistent vomitting
3. Rapid breathing
4. bleeding from the nose and gums
5. Fatigue
6. enlargement of liver
7. reduced number of platelets
8. restlessness and blood in vomit
9. Symptoms may progress to massive bleedivy
10. Very low blood pressure

37 x 4 = 148

Max. 150