ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்

අ.පො.ස. (උ.පෙළ) විභාගය / க.பொ.த. (உயர் தர)ப் பரீட்சை - 2025

විෂය අංකය
பாட இலக்கம் **09**

විෂයය
பாடம் **Biology**

ලකුණු දීමේ පටිපාටිය / புள்ளி வழங்கும் திட்டம்

I පත්‍රය / பத்திரம் I

ප්‍රශ්න අංකය வினா இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය வினா இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය வினா இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය வினா இல.	පිළිතුරු අංකය விடை இல.	ප්‍රශ්න අංකය வினா இல.	පිළිතුරු අංක விடை இ
01.	3	11.	5	21.	2	31.	2	41.	2
02.	4	12.	3	22.	3	32.	1	42.	1
03.	4	13.	4	23.	4	33.	5	43.	1
04.	1	14.	5	24.	5	34.	3	44.	2
05.	5	15.	3	25.	5	35.	2	45.	4
06.	3	16.	2	26.	2	36.	1	46.	4
07.	3	17.	5	27.	2	37.	4	47.	5
08.	1	18.	3	28.	5	38.	4	48.	5
09.	5	19.	1	29.	4	39.	4	49.	1
10.	3	20.	2	30.	3	40.	2	50.	5

✪ විශේෂ උපදෙස් / விசேட அறிவுறுத்தல் :

එක් පිළිතුරකට / ஒரு சரியான விடைக்கு ලකුණු 01 බැගින් / புள்ளி வ

මුළු ලකුණු / மொத்தப் புள்ளிகள் $\frac{02}{01} \times 50$ =

Catalyst drive for

Part A - Structured Essay

1. (A) (i) State **two** properties of monosaccharides.

- Reducing
- water soluble
- occur in crystalline form **(any 2)** **2 pts**

(ii) (a) What is the indicator used in the lipid test?

Sudan III **1 pt**

(b) What is the first step of a simple test carried out to identify non-reducing sugars in a solution?

Adding dilute HCl / Dilute H_2SO_4 (Dil. HCl ✓✓ Dil. H_2SO_4 ✗) **1 pt**

Practical manual - pg 48

(iii) Name **one** structural protein having each of the following structures.

(a) Secondary structure : Keratin

(b) Quaternary structure : Collagen **2 pts**

(iv) Name the site in prokaryotic cells and **two** specific sites in eukaryotic cells where 70S ribosomes are present.

(a) Prokaryotic cells : Cytosol / cytoplasm **1 pt**

(b) Eukaryotic cells : Matrix of mitochondria

Stroma of chloroplasts **2 pts**

(v) What is the main component in the middle lamella of plant tissues?

Pectin / Ca-pectate / Mg-pectate **1 pt**

(B) (i) Name a subcellular component of eukaryotic cells that carries out each of the following functions.

(a) Manufacturing cellulose : Golgi apparatus (Golgi complex ✗✗ Golgi body ✓✓)

(b) Converting fatty acids to sugar : Glyoxysome

(c) Synthesis of glycoproteins : Rough Endoplasmic reticulum/ Rough ER (RER)

(d) Metabolism of carbohydrates : Smooth Endoplasmic reticulum/ Smooth ER (SER)

(e) Maintaining water balance : Central vacuole / Contractile vacuole

(f) Detoxification : Peroxisomes/ Smooth ER / Smooth endoplasmic reticulum **6 pts**

Catalyst drive free

(ii) State the stages of meiosis where each of the following occurs.

(a) Separation of sister chromatids : Anaphase II

(b) Crossing over : Prophase I

(c) Reforming of nuclear envelope : Telophase I , Telophase II 4 pts

(iii) State **two** specific sites where substrate phosphorylation occurs during the aerobic cellular respiration of a glucose molecule in a eukaryotic cell. 2 pts

→ Cytosol, Matrix of mitochondria

jelly like fluid part → cytoplasm ××

entire content within the cell membrane

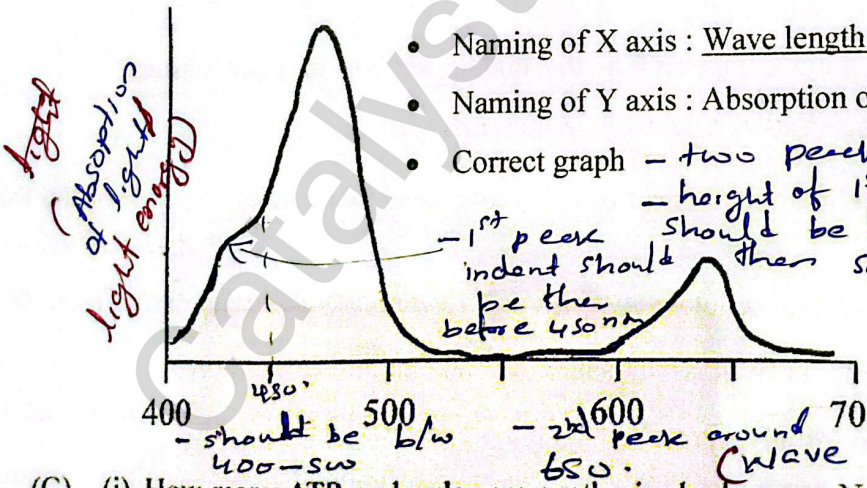
(iv) How is an enzyme catalyzed reaction affected when the temperature increases above the optimum level?

- Disrupting hydrogen bonds (H-bond ✓✓)
- ionic bonds
- weak chemical bonds of the active site.

No marks for only chemical bond (~~if written chemical bonds consider as 1~~) 4

- Changing the shape of the active site,
- altering the complementary nature of the active site
- preventing the complementary binding of (enzyme) active sites and substrate molecules. 6

(v) Indicate below the absorption spectrum of chlorophyll b using a labelled graph.



- Naming of X axis : Wave length of light (nm) ← 1 — 1
- Naming of Y axis : Absorption of light / Light energy — 1 — 1
- Correct graph — two peaks — 1 — 1
  - height of 1st peak should be higher than second
  - 1st peak indent should be the before 450nm
  - should be 400–500 b/w
  - 2nd peak around 650.

without nm can give marks

(C) (i) How many ATP molecules are synthesized when one NADH molecule and one FAD molecule are oxidized in the electron transport chain?

NADH : 2.5

$FADH_2$: 1.5 2

Catalyst drive proe

more answers are given than required number - Negative marks applied.

(ii) Name the **three** products of the link reaction of aerobic respiration of a glucose molecule.

- CO_2 – Carbon dioxide
- NADH
- Acetyl CoA **3 pts**

(iii) Based on fossil records, about how many years after the origin of prokaryotic cells did eukaryotic cells originate?

1.7 billion **1pt**

(iv) Name the group of animals from which the earliest tetrapods have evolved.

lobed fin fish No other answer sticked to Resource book **1pt**

(v) During the evolution of biodiversity, about how many years ago would each of the following have occured?

(a) Appearance of first food chains : 700 million

(b) Differentiation of large trees into roots, stems and leaves : 380 million **2 pts**

40 pts x 2½ marks
Total = 100 marks

2. (A) (i) How is the name of the person who introduced the name to a species of organisms indicated in scientific writing?

- By a capital letter/ By first letter of the name
- as an abbreviation or
- as full name/ full word,
- which is not latinized / not italicized / not underlined
- at the end of the (species) name. **5 pts**

(ii) Name **two** classes of phylum Chordata that show each of the following features.

(a) Endothermy : Aves , Mammalia

(b) Keratinized structures : Reptilia , Aves , Mammalia **(Any 2)**

(c) External fertilization : Osteichthyes , Amphibia **6 pts**

(iii) State **three** structures of shark that can be seen externally, which are characteristic features of class Chondrichthyes.

- Fins
- Placoid scales (No operculum xx)
- Cloacal opening (Cloaca xx)
- Heterocercal caudal fin **(Any 3)** **3 pts**

Catalyst drive force

(iv) Name **three** phyla which include animals that do **not** possess respiratory structure other than body wall.

- Cnidaria
- Platyhelminthes
- Nematoda

3

(v) Name **three** photosynthetic pigments that are present in both brown algae and gold brown algae.

- Chlorophyl a
- Chlorophyl c
- Xanthophyll

3

(B) (i) How do the xylem vessels of spring wood structurally differ from those of summ wood in plants?

Due to presence of large lumen and thin walls (in spring wood)

2

(ii) What is the chemical compound used to stain a cross section of a secondary thicken dicot stem?

Aniline sulphate

1

(iii) How does phloem sap mainly differ from xylem sap?

Because it contains sucrose (30% by weight)

1

(iv) Name the element which is involved in signal transduction in plants.

Calcium / Ca (Ca^{2+} ✗✗)

1

(v) (a) What is the structure produced from the ovary wall during fruit development plants?

Pericarp

1

(b) How do plants detect gravity?

by settling of statoliths

1

(C) (i) Why is bone tissue considered as a connective tissue?

Due to, presence of different types of fibers, different types of cells and large extracellular matrix

1

Catalyst drive force

(ii) (a) A person who does not take any medicine such as aspirin was diagnosed to be suffering from gastritis. State **two** most possible reasons for this condition.

- Prolonged starvation
- mental stress **2 pts**

(b) Name **two** vitamins that act as antioxidants.

- Vitamin C
- Vitamin E **2 pts**

(iii) (a) Name **three** respiratory pigments present in annelids.

- Haemoglobin
- Haemoerythrin
- Chlorocruorin **3 pts**

(b) Why doesn't CO_2 compete for oxygen binding sites in haemoglobin?

Because CO_2 binds with the protein group /globin of haemoglobin while O_2 binds with haem group /Fe atom/ Fe^{2+} **1 pt**

(iv) How does cigarette smoke contribute to cause bronchitis?

- By stimulating the secretion of mucus (by goblet cells) and
- inhibiting the action of the cilia in the respiratory tract
- causing accumulation of mucus in bronchioles and blocking them. **3 pts**

(v) How do sebaceous glands contribute to innate immunity of humans?

Their secretion provides acidity (to skin) preventing bacterial growth (on skin) **1 pt**

stoping - not complete

inhibiting. reducing.

40 pts x 2½ marks
Total = 100 marks

3. (A) (i) (a) State **two** factors that influence the excretory products of metabolic substrates in animals.

- Chemical structure / chemical composition
- Availability of enzymes (for metabolism)
- Availability of oxygen
- Habitat / environment they live in **(Any 2)** **2 pts**

(b) State the place to which the malpighian tubules of insects open.

Digestive tract /alimentary canal / gut **1 pt**

Catalyst drive force

(C) (i) (a) How does the hydroskeleton of nematodes aid in locomotion?

Due to combined effect of contraction of (longitudinal) muscles in the body wall and fluid pressure in the pseudocoelom / body cavity ..... 1 p

(b) Why is fusiform body shape of birds important for movement through air?

To reduce drag force(in air) / to reduce resistance(of air) ..... 1 p

(concept ✓✓)

(ii) Name the **two** paired bones in the human cranium.

- Parietal bones ..... 2 p
- Temporal bones .....

(iii) (a) State a function of the human sternum other than support and protection of internal structures.

Production of blood cells(from red bone marrow)/ Production of red blood cells 1

(/production of erythrocyte)

(b) Name a degenerative non-inflammatory disease that causes pain in the joints of humans.

Osteoarthritis 1

(iv) In skeletal muscle contraction, what is required for breaking the existing cross bridge to begin new cross bridge cycles?

ATP (Binding of ATP to myosin (head)) 1

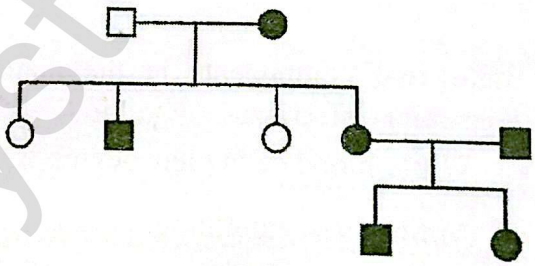
(ATP hydrolysis xx)

(v) Inheritance of a dominant trait in three generations is shown in the pedigree ch given below.

1st generation

2nd generation

3rd generation



Considering the dominant allele as H and recessive allele as h, indicate the genoty of the parents of the 3rd generation.

Father : HH , Hh ..... ; Mother : Hh .....

only one is correct put the correct mark don't give mark

40 pts x 2½ m

Total = 100 m

Catalyst drive force

4. (A) (i) (a) What are the main components of the translation initiation complex formed during the synthesis of polypeptides?

- Ribosomal (small) sub unit/s
- mRNA
- Initiator tRNA **3 pts**

(tRNA which carry metheonine aminoacid ??)

(b) Name the protein involved in preventing the re-pairing of separated DNA strands during DNA replication.

Single strand binding proteins / SSB **1 pt**

(ii) State **three** techniques used in DNA analysis other than PCR.

- Gel electrophoresis
- DNA sequencing
- Restriction maps
- DNA fingerprinting **(any three)** **3 pts**

(iii) Define each of the following.

(a) Community : Collection of populations of different species living in the same area interacting with each other **1 pt**

(b) Ecosystem : Collection of communities and the abiotic factors with the which they interact tamil resource book **1 pt**

(iv) (a) Why is the soil of tundras moist even though they receive a small amount of precipitation?

- Little evaporation due to cold climate
- No deep drainage due to frozen soil **2 pts**

(b) State the major abiotic characteristics of salt marshes.

- Low rainfall
- High wind
- High temperature
- Loose sand
- Sand blowing with salt
- Drying up of soil to form salt crystals (during dry season) **(any five)** **5 pts**

Catalyst drive force

(v) (a) What is a flagship species?

A species chosen as a symbol / icon to represent an ecosystem that needs conservation 1

(b) State **two** characteristics of biodiversity hot spots.

- High endemicity / High concentration of endemic species
- (Exceptionally / very) High level of threat 2

(B) (i) What are the **two** main driving forces of desertification?

- Climate change / variation
- Human activities 2

(ii) (a) What is controlled by Basel convention? (1) (1) 2P

Transboundary movement of hazardous waste and their disposal 1

(b) Name the international agreement relevant to the protection of ozone layer.

Montreal protocol / agreement / treaty 1
convention

(iii) Name a chemical used for sterilization of each of the following.

(a) Mattresses in hospital beds :

Ethylene oxide

(b) Enclosed building areas contaminated with endospores of *Bacillus anthracis*

Chlorine dioxide

(iv) State in correct sequence the steps of a procedure to prepare a smear for stai microorganisms in a toddy sample.

- Using a sterile (cooled) inoculating loop, spread the sample (in the shape of the t circle) on a clean glass slide.
- Air drying
- Heat fix (the smear) by passing through / over flame 2 - 3 times.

if the 2nd step is omited or wrong give marks for the 1st point only.

1st step is x x no marks

(v) State **two** properties of *Salmonella typhi* toxin other than the ability to cause dis

- Lipopolysaccharide
- Thermostable
- Released when bacteria die / bacterial cell walls break (any two)

Catalyst drive force

(C) (i) How are phosphate solubilizing bacteria involved in releasing phosphorus in to the soil solution?

By secreting organic acids that dissolve minerals containing phosphorus / P and chelate cationic partners of phosphate ions / PO_4^{3-} **2 pts**

(ii) Name a bacterial genus that produces vitamin B_{12}.

Pseudomonas / Propionibacterium **1 pt**

(iii) State the internal factors that influence food spoilage.

- pH
- Moisture content
- Nutrient content
- Biological structure

4 pts

(iv) Name a bacterial genus other than *Vibrio* that contaminates water supplies.

Salmonella / Shigella **1 pt**

(v) State **two** conditions that have to be completed by a viable seed for germination.

- Subjected to suitable environmental conditions
- Dormancy should be overcome

2 pts

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Catalyst drive force

මෙය ම වසිසේ ගුවිසේ /முழுப் பதிப்புரிமையுடையது/All Rights Reserved

இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka
අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2025
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2025
General Certificate of Education (Adv. Level) Examination, 2025

09 E II

ජීව විද්‍යාව II
உயிரியல் II
Biology II

Part B - Essay

Instructions:

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

5. (a) Explain the Calvin cycle of photosynthesis.

   (b) Briefly describe the characteristic features of kingdom Fungi.

6. (a) Describe the primary structure of a dicot root.

   (b) Discuss the impacts of low temperatures on plants and explain how plants respond to cold stress.

7. (a) Explain the role of natural killer cells in immunity of humans.

   (b) Describe the active immunity of humans.

8. (a) Briefly describe the structural arrangement of a synapse and explain the mechanism of transmitting a nerve impulse through a chemical synapse.

   (b) Briefly describe the symptoms and associated reasons of Parkinson disease in humans.

9. (a) Explain the process of DNA isolation in gene technology.

   (b) Describe the main steps and associated principles in purification of industrial wastewater.

10. Write short notes on the following.

    (a) Common human traits that show Mendelian pattern of inheritance

    (b) Tropical thorn scrubs in Sri Lanka

    (c) Environmental impacts of ornamental fish culture

* * *

Catalyst drive force

Paper II : Part B - Essay

05. (a) Explain the Calvin cycle of photosynthesis.

(b) Briefly describe the characteristic features of kingdom Fungi.

(a) Calvin cycle of photosynthesis

1. Takes place in the stroma of the chloroplast.
2. Reactions of the Calvin cycle are anabolic.
3. CO_2 is added to Ribulose bisphosphate/ RuBP/ CO_2 acceptor is Ribulose bisphosphate / RuBP,
4. which is a 5 C sugar (molecule).
5. This is called carboxylation / carbon fixation.
6. The enzyme involved in/ catalyzing (this reaction) is RuBP carboxylase oxygenase/ Rubisco.
7. The first product is a 6 C molecule,
8. which is unstable.
9. 10. It breaks down into two molecules of 3-phosphoglycerate/ 3-PGA, immediately.
11. 3-PGA is converted to 1,3 bisphosphoglycerate,
12. by adding a phosphate group,
13. which is obtained from ATP.
14. This 1,3 bisphosphoglycerate is reduced to glyceraldehyde 3-phosphate/ G3P
15. which is the precursor of carbohydrate/ glucose
16. using NADPH.
17. 18. NADPH and ATP (used in the Calvin cycle) are produced in the light reaction (of photosynthesis).
19. For the synthesis of one molecule of G3P, Calvin cycle must takes place three times.
20. 21. RuBP is regenerated, using ATP.

Catalyst drive force

(b) Characteristic features of kingdom Fungi

1. Eukaryotic.
2. Cell walls are made up of chitin.
3,4. Absorptive and heterotrophic.
5. Secrete extracellular enzymes/ carry out extra cellular digestion.
6,7,8. Live as decomposers, parasites, or mutualists.
9,10. Unicellular or multicellular.
11. Some (multicellular) form filaments/hyphae.
12. Some have septa.
13. Some are coenocytic/ without septa.
14. Septa have holes,
15. to enable the movement of mitochondria/ribosomes/nuclei/organelles/cellular component
16. Hyphae produce mycelium.
17. Some produce haustoria.
18,19. Show sexual and asexual reproduction.
20. Produce spores.

21 + 20 = 41 po

Any 37 points x 4 = 148 ma

If more than 37 points are correct, add 2 ma

Total 150 ma

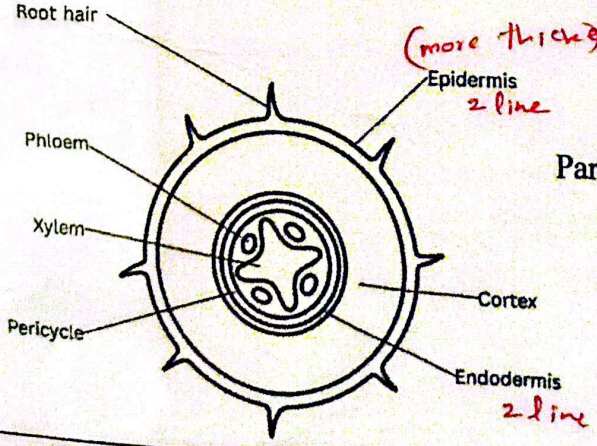
Catalyst drive force

06. (a) Describe the primary structure of a dicot root.

(b) Discuss the impacts of low temperature on plants and explain how plants respond to cold stress.

(a) Primary structure of a dicot root

1. Outermost layer is epidermis.
2. Some epidermal cells produce fingerlike structures/ processes,
3. which are called root hairs.
4. Ground tissue is present between the epithelium and vascular cylinder,
5. which is called cortex.
6,7. It is mainly composed of parenchyma cells with intercellular spaces.
8. Innermost layer of cortex is endodermis,
9. which is a single layer (of cells).
10. Endodermis contains a suberin belt,
11. which is called Casparian strip
12. and it does not have intercellular spaces.
13. A pericycle is present interior to the endodermis.
14. Pericycle consists of 2-3 parenchyma cell layers,
15. Vascular tissues are present inner to pericycle,
16. as a solid core.
17,18. Xylem is present in the middle and is star shaped in cross section.
19. Phloem is located (in the groove) between the arms of the xylem.



Fully labelled correct diagram 10 marks
Partially labelled (3-6) correct diagram 5 marks
< 3 labels or Unlabeled diagram 0 marks

Catalyst drive force

(b) Impacts of low temperature on plants and how plants respond to cold stress.

Impact of low temperature on plants

1. Cell membrane loses its fluidity (when it cools below a critical temperature)
2. because lipids become locked into a crystalline structure.
3. This blocks transport across the membrane,
4. which affects the cell functions.
5,6. Water in cell walls and intercellular spaces freezes first/ before the water in cytosol.
7. This is because water in cytosol is rich in solutes.
8. Reduction of liquid water in cell wall lowers extracellular water potential,
9. and water in cytosol comes out
10. resulting in high concentration of solutes in cytosol/ cytoplasm.
11,12. This is harmful and may lead to cell death.

How Plants respond to cold stress

13. Alter lipid composition of the cell membrane/ plasma membrane
14. by increasing its unsaturated fatty acid proportion/content.
15. This helps to keep the membrane more fluid (at low temperatures).
16,17. Increase the ~~cytoplasmic~~ levels of specific solutes, such as sugars,
18. which helps to reduce the water loss (from the cell)/ prevent dehydration.

19 + 18 = 37 po
Any 35 points x 4 = 140 ma
Diagram =10 ma
Total 150 ma

Catalyst drive force

07. (a) Explain the role of natural killer cells in immunity of humans.

(b) Describe the active immunity of humans.

(a) Role of natural killer cells in immunity of humans

1,2. They are involved in internal defenses in non-specific defense/ innate immunity

3. They detect cells with abnormal surface molecules,

4,5. such as virus infected cells and (some) cancerous/ cancer cells,

6,7,8. and bind to them, release chemicals and kill/ destroy them,

9. Preventing/ inhibiting (further) spread of virus/ cancer.

(b) Active immunity of humans

1. It is a long lasting immunity (developed in the body).

2,3,4,5. It is mediated by B lymphocytes/ B cells, T lymphocytes/ T cells, memory B cells and memory T cells, *(If stated as lymphocytes and memory cells consider as only two points),*

6. specific for a pathogen.

7. Memory B cells are produced by humoral/ antibody mediated immune responses,

8. and memory T cells are produced by cell mediated immune responses.
(if stated as memory cells are produced by cell mediated and antibody mediated/ humoral immune responses, consider as one point).

9,10. Active immunity can be naturally acquired or artificially acquired.

11. Naturally acquired active immunity is due to natural infections (of pathogens).

12. Artificially acquired active immunity is due to vaccination/ immunization.

13,14,15. Vaccines/antigens are produced from (sources such as) killed/ weakened/ inactivated attenuated/ virulence reduced-pathogens, inactivated bacterial cells or genes encoding microbial proteins.

16,17. Antigens used in vaccines are immunogenic and not pathogenic.

18. Memory B cells and memory T cells/ memory cells are long lived

19,20. and provide a stronger and rapid immune response if the same pathogen/ antigen is encountered later

21. and destroy/ kill it.

22,23. (When infected by the same pathogen) memory T cells give rise to cytotoxic T cells and helper T cells. *(If stated as effector T cells only, consider as one point).*

24,25. Cytotoxic T cells kill infected cells/ pathogens using toxic

26,27. Helper T cells activate cytotoxic T cells and B lymphocytes/ B cells.

Catalyst drive force

28. Activated B lymphocytes/ B cells produce plasma cells.
29. (When infected by the same pathogen), memory B cells produce plasma cells.
30. Plasma cells produce antibodies/ soluble form of B lymphocyte/ antigen receptors
31. which can neutralize/ inactivate specific toxins/ pathogens in the body fluids.
32. Active immunity provides protection against subsequent infections of the same pathogen / Due to active immunity subsequent infections of the same pathogen can be resisted.

9 + 32 = 41 points
Any 37 points x 4 = 148 marks
If more than 37 points are correct add 2 marks
Total 150 marks

08. (a) Briefly describe the structural arrangement of a synapse and explain the mechanism of transmitting a nerve impulse through a chemical synapse.

(b) Briefly describe the symptoms and associated reasons of Parkinson disease in humans.

(a) Structural arrangement of a synapse

1,2. It is a junction between (the axon terminal of) a neuron/ presynaptic cell and another cell/ post synaptic cell across a narrow gap/ synaptic cleft.

3,4,5. The other cell/ post synaptic cell is another neuron, a muscle cell or a secretary cell.

Transmission of an impulse through a chemical synapse

6. Action potential at the axon terminal depolarizes the plasma membrane of presynaptic cell
7. and Ca^{2+} diffuses into axon terminal.
8. When Ca^{2+} (content) is increased (in axon terminal)
9. synaptic vesicles (with neurotransmitters) bind to presynaptic membrane and
10. release neurotransmitters into synaptic cleft.
11. Neurotransmitters diffuse across the synaptic cleft
12,13. and bind to specific receptors of the postsynaptic membrane and activate them.
14. Acetylcholine is a neurotransmitter
15,16,17. Binding of this neurotransmitter/ acetylcholine to the postsynaptic membrane results in diffusion/ transport/ movement of Na^+ and K^+ across postsynaptic membrane.
18,19. Postsynaptic membrane depolarizes, reaches action potential

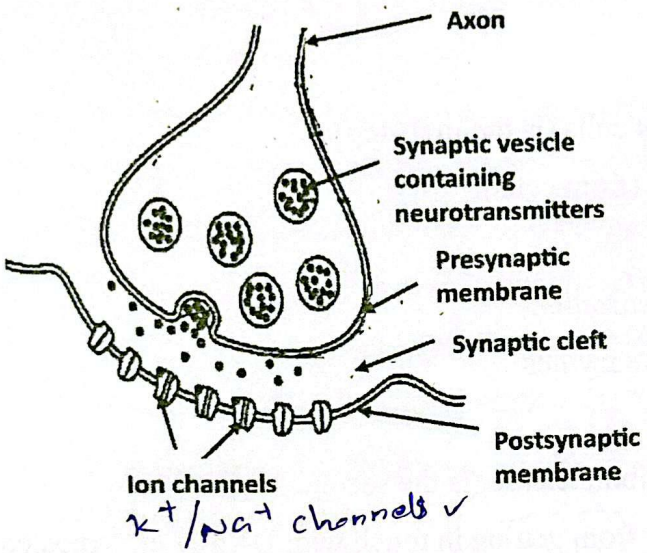
Catalyst driveforce

20. and impulse is passed to postsynaptic cell.

21. Then the signal at the presynaptic axon terminal/ membrane is terminated by

22. enzymatic hydrolysis of neurotransmitter or

23. recapture of neurotransmitter into presynaptic terminal/ cell.



double line not necessary single line give marks

(b) Fully labelled correct diagram 10 marks

Partially labeled (3-5) correct diagram 5 marks

< 3 labels or unlabeled diagram 0 marks

(b) Symptoms

1. Slowness of movements
2. Difficulty in initiating movements
3. Poor balance
4. Fixed muscle tone
5. Lack of facial expression
6. speech problems
7. muscle tremor (at extremities)

8,9,10. e.g. Shaking hand, shaking fingers, shaking head

Associated reasons

11,12,13. (Gradual) degeneration of dopamine (neurotransmitter) releasing neurons located in the midbrain and basal ganglia. (if brain is written instead of midbrain and basal ganglia consider, as **1 point**)

14. Genetic factors

23 + 14 = 37 points

Any 35 points x 4 = 140 marks

Diagram =10 marks

Total 150 marks

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09. (a) Explain the process of DNA isolation in gene technology.

(b) Describe the main steps and associated principles in purification of industrial wastewater.

(a) Process of DNA isolation in gene technology.

There are several major steps

1. Disruption/ breaking/ lysis of cells (is the first step).
2. This is done to release DNA (from cells).
3. by mechanical methods,
4,5. such as grinding and homogenization
6. and also enzymatically /by lysozymes
7. to break bacterial cell walls.
8. Inhibition of DNase/ Deoxyribonuclease (is the second step).
9. This is done to prevent DNA from getting in touch with DNase/ enzymes causing shearing/ to protect DNA from DNase/ shearing enzymes .
10. This is done using/ adding chelating agents
11,12. to remove metal ions which are required for DNase/ nuclease activity.
13. Dissociation of nucleoproteins (is the third step).
14. This is done to free DNA from proteins that bind to them.
15. Here DNA-protein interactions are disrupted.
16,17,18. by detergents/ SDS/ Sodium dodecyl sulphate or phenol or proteolytic enzymes.
19. Removal of contaminating materials/all other molecules in the cell (is the fourth step).
20. Precipitation of DNA (is the fifth step).
21. This is done using cold ethanol.
22. This precipitate is redissolved in a buffer.
23. RNA is removed by limited treatment with (DNase free) RNase/ ribonuclease.

(Any 19 points)

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(b) **Main steps and associated principles in purification of industrial wastewater.**

1,2. (There are two treatments): Primary treatment and Secondary treatment

3,4,5. During the primary treatment, large floating materials, sand, oil/ grease are removed.

6,7. Solid matter is settled in sedimentation tanks.

8. Sludge is collected/ removed.

9. No biological activity is used (in primary treatment).

10. (About) 25-35% of organic matter is removed in the primary treatment.

11. During the secondary treatment, wastewater (from primary treatment) is aerated

12. to facilitate growth of aerobic bacteria/ for rapid microbial oxidation.

13,14. This is done using activated sludge or trickling filter.

15. In activated sludge vigorous aeration is done mechanically.

16. In trickling filters, wastewater is sprayed/ sprinkled over a bed of rocky material

17. and allowed to trickle.

18,19. Here microorganisms grow on filter bed and oxidize organic matter.

20. 75-95% of (remaining) organic material is oxidized in secondary treatment.

21. Liquid is then disinfected (and allowed to flow into natural water ways)

22. Sludge is sent to an anaerobic sludge digester

23. where it is converted to CH_4 and CO_2 / converted to biogas

(Any 19 points)

19 + 19 = 38 points
Any 37 points x 4 = 148 marks
If more than 37 points are correct add 2 marks
Total 150 marks

Catalyst drive force

10. Write short notes on the following.

(a) Common human traits that show Mendelian pattern of inheritance

(b) Tropical thorn scrubs in Sri Lanka

(c) Environmental impacts of ornamental fish culture

(a) Common human traits that show Mendelian pattern of inheritance

Common Mendelian traits are

1. Attached/ Detached/ Free ear lobe,
2. Widow's peak/ Pointed contour of hairline/ V-shape point of hair of forehead/ No widow's peak
3. Dimples on the cheek/ Not showing Dimples on the cheek,
4. Straight thumb/ Bent thumb/ Ability to bend thumb backward/ Hitchhiker's thumb and
5. Rolling tongue/ non-rolling tongue.
6. Attached ear lobe is a recessive trait/ due to homozygous recessive condition.
7. Free ear lobe is a dominant trait/ due to the presence of the dominant allele/ Homozygous dominant condition/ Heterozygous condition
8. Widow's peak is controlled by dominant allele/dominant trait/ due to the presence of the dominant allele/ Homozygous dominant condition/ Heterozygous condition
9. Not showing Widow's peak is a recessive trait/ due to homozygous recessive condition.
10. Dimple is a dominant trait/ due to the presence of the dominant allele/ Homozygous dominant condition/ Heterozygous condition.
11. Not showing Dimples is a recessive trait/ due to homozygous recessive condition
12. Straight thumb/ ~~Hitchhiker's thumb~~ is a dominant trait/ due to the presence of the dominant allele/ Homozygous dominant condition/ Heterozygous condition
13. Bent thumb/ Hitchhikers thumb is a recessive trait/ due to homozygous recessive condition.
14. Rolling tongue is a dominant trait/ due to the presence of the dominant allele/ Homozygous dominant condition/ Heterozygous condition
15. Non-rolling tongue is a recessive trait/ due to homozygous recessive condition.

(Any 13 points)

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(b) Tropical thorn scrubs in Sri Lanka

1. Located in the arid zone/ in areas where rainfall is less than 1000 mm
2. in lowlands/ at an altitude less than 300 m
3. where temperature is 32 -36°C/ mean annual temperature is (around) 34°C
4. with long dry periods.
5. Large trees are sparse.
6. Vegetation is mainly thorny shrubs.
7,8. Common plants are Gini-andara/ Vindattai, Ranawara/ Avarampoo, and Heeressa/ Pirandai (Any two examples)
9,10,11. few faunal/ animal species:(Some) examples are deer, leopard and elephants (two points for any two examples).
12. They are found in Hambantota/ Yala/ Mannar/ Puttalam areas
13. and disturbed due to development activities.

(c) Environmental impacts of ornamental fish culture

1,2. These impacts can be beneficial or harmful.

Beneficial impacts:

3,4. Helps in species/ biodiversity conservation e.g. Golden arowana/ tiger barb
5. Production of species that are difficult/ prohibited to get from wild.
6. Reintroduction of fish into habitats/ places where they have been eliminated.

Harmful impacts:

7. Introduction/ escaping of invasive species/ invasive ornamental fish/ invasive aquatic plants to natural environment/ecosystem
8. affecting wide range of native organisms/ affecting native organisms ranging from zooplankton to mammals and
9. multiple levels/ ranges of biological organizations/ from genome to ecosystem.
10. Introduction of non-indigenous disease causing organisms.
11,12.13. Release of (water with) antibiotics and other therapeutic chemicals to the environment, develop resistance in pathogenic microorganism (against them)

13 + 13 + 13 = 39 points
Any 37 points x 4 = 148 marks
If more than 37 points are correct add 2 marks
Total 150 marks

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Catalyst drive force