AL/2024/09/E-I

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2024
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2024
General Certificate of Education (Adv. Level) Examination, 2024

ජීව විද්‍යාව I உயிரியல் I **Biology I**	**09 E I**	පැය දෙකයි இரண்டு மணித்தியாலம் ***Two hours***

Instructions:

* *Answer **all** questions.*
* *Write your **Index Number** in the space provided in the answer sheet.*
* *Instructions are given on the back of the answer sheet. Follow them carefully.*
* *In each of the questions from **1** to **50**, pick one of the alternatives from* (1), (2), (3), (4), (5) *which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross*** (×) *on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*

1. Which of the following is considered as the basic functional unit of life?
(1) Organ (2) Tissue (3) Cell (4) Nucleus (5) DNA molecule

2. Which of the following statements is correct regarding carbohydrates?
(1) Condensation reaction between two glucose molecules forms a non-reducing sugar molecule.
(2) Galactose is a ketose sugar.
(3) Glucosamine is the monomer of storage components in fungi.
(4) Galacturonic acid is the monomer of a structural polysaccharide in plants.
(5) Hemicellulose is a branched polysaccharide made up of trioses and pentoses.

3. In mitochondria,
(1) a DNA molecule is present in the intermembrane space.
(2) enzymes required for Krebs cycle are embedded in the inner membrane.
(3) 80S ribosomes and phosphate granules are located in the matrix.
(4) a pyruvate molecule is converted to an acetyl Co-A molecule by releasing two CO_2 molecules in the matrix.
(5) cristae contain enzymes that are essential for oxidative phosphorylation.

4. Which of the following occurs during both telophase I and telophase II of meiosis?
(1) Formation of spindle apparatus by centrosome
(2) Moving of one chromosome of each homologous pair towards opposite poles
(3) Decondensation of chromosomes into chromatin
(4) Formation of two genetically identical haploid daughter nuclei within one cell
(5) Shortening of microtubules of the spindle

5. In addition to chloroplasts, the enzymes that catalyse photorespiration are located in
(1) mitochondria and Golgi apparatus.
(2) peroxisomes and mitochondria.
(3) lysosomes and smooth endoplasmic reticulum.
(4) glyoxysomes and Golgi apparatus.
(5) lysosomes and Golgi apparatus.

[See page two

6. A product of the Calvin cycle that serves as a precursor molecule for glucose synthesis is
(1) 3–phosphoglycerate.
(2) ribulose bisphosphate.
(3) glyceraldehyde 3–phosphate.
(4) phosphoenolpyruvate.
(5) 1, 3–bisphosphoglycerate.

7. The total number of ATP and NADH molecules produced per one molecule of glucose in glycolysis is respectively
(1) two and one.
(2) two and two.
(3) 2.5 and one.
(4) four and one.
(5) four and two.

8. Which of the following statements regarding vascular plants is correct?
(1) Microphylls of some vascular plants have branched veins.
(2) Roots were present in the ancestors of modern vascular plants.
(3) Presence of stomata is unique to vascular plants.
(4) Some vascular plants have symbiotic gametophytes.
(5) Flagellated sperm are absent in vascular plants.

9. Which of the following combinations of plant phyla and their gametophytes is/are correct?

Phylum	Gametophyte
A – Bryophyta	Dioecious
B – Pterophyta	Photosynthetic
C – Cycadophyta	Reduced

(1) A only.
(2) A and B only.
(3) A and C only.
(4) B and C only.
(5) A, B and C.

10. Some features present in two animals labelled as A and B are as follows.
A – Endoskeleton, closed circulatory system, coelom
B – Exoskeleton, open circulatory system, gills
The phyla to which A and B could belong are respectively,
(1) Chordata and Nematoda.
(2) Chordata and Echinodermata.
(3) Annelida and Arthropoda.
(4) Echinodermata and Mollusca.
(5) Nematoda and Arthropoda.

11. The animals that showed first signs of cephalization
(1) bear a central nervous system.
(2) have jointed legs.
(3) are coelomic.
(4) are radially symmetrical.
(5) bear a muscular foot.

12. Some types of plant cells and their functions are given below.

Type of cells	Function
A – Sclerenchyma	P – Providing support
B – Collenchyma	Q – Transporting water
C – Tracheids	R – Storage of starch
D – Parenchyma	S – Wound repair

Select the response that indicates all correct combinations of 'cell type - function'.
(1) A – Q, B – S, C – P, D – R
(2) A – P, B – R, C – Q, D – S
(3) A – P, B – P, C – Q, D – R
(4) A – R, B – S, C – P, D – S
(5) A – Q, B – P, C – S, D – R

[*See page three*

13. Which of the following statements regarding plant meristems is correct?
(1) Lateral meristem and apical meristem are involved in secondary growth.
(2) Shoot apical meristem produces new cells both inward and outward.
(3) Regrowth of broken leaves of monocots occurs due to the action of lateral meristem located at their bases.
(4) Lateral meristem contributes to the formation of periderm.
(5) Meristems are always active.

14. Select the correct statement regarding water loss in plants.
(1) Guttation occurs throughout the day.
(2) Transpiration rate is high when relative humidity is high.
(3) About 50% of water in plants is lost due to stomatal transpiration.
(4) Water loss decreases due to increase in turgor in guard cells.
(5) Root pressure is needed for guttation.

15. Deficiency of which of the following elements cause chlorosis, poor growth and death of leaf tips in plants respectively?
(1) Mg, C and B (2) S, O and Ni (3) N, H and Cl
(4) Mo, Ca and Fe (5) P, B and Ni

16. The eight nuclei in mature embryo sac of angiosperms are contained within
(1) two antipodal cells, two central cells, two synergids and egg.
(2) three antipodal cells, central cell, two synergids and egg.
(3) two antipodal cells, three central cells, synergid and egg.
(4) three antipodal cells, central cell, three synergids and egg.
(5) three antipodal cells, two central cells, two synergids and egg.

17. Which of the following plant hormones stimulate seed germination?
A – Cytokinins
B – Abscisic acid
C – Auxins
D – Gibberellins
(1) A and B (2) A and C (3) A and D
(4) B and C (5) B and D

18. Which of the following statements regarding the structures associated with tissues that provide support in animals is/are correct?
A – Chondrocytes secrete collagen fibres.
B – Osteocytes are bone forming cells.
C – Osteons are the repeating units of mammalian hard bones.
(1) A only. (2) A and B only. (3) A and C only.
(4) B and C only. (5) A, B and C.

19. Some organs in the human digestive system, enzymes associated with digestion and the substrates on which these enzymes act are given below.

Organ	**Enzyme**	**Substrate**
A – Mouth	D – Pepsin	G – Polysaccharides
B – Stomach	E – Amylase	H – Lipids
C – Small intestine	F – Lipase	I – Proteins

Select the correct combination of the above.
(1) A, D, I (2) B, E, G (3) B, F, H (4) C, D, I (5) C, E, G

[*See page four*

20. Select the correct statement regarding vitamins.
(1) All antioxidants are water soluble vitamins.
(2) Vitamin A deficiency reduces immunity.
(3) Vitamin E helps in the absorption of phosphorous.
(4) Vitamin K is necessary to maintain epithelial tissues.
(5) Production of red blood cells is reduced due to vitamin C deficiency.

21. During a cardiac cycle, stimulation of which of the following structures of the human heart results in emptying of atria?
(1) SA node (2) AV node (3) AV bundle
(4) AV bundle branches (5) Purkinje fibres

22. Which of the following statements regarding respiration of man is correct?
(1) Elevated blood pH can increase the depth and rate of lung ventilation.
(2) Decrease in the pressure in the lungs in relation to outside air facilitates expiration.
(3) Sensors in the lung tissue contribute to prevent overexpansion of lungs during inspiration.
(4) High surface tension of the fluid that coat the alveolar lining facilitates external respiration.
(5) Higher partial pressure of CO_2 in the blood reaching tissues in systemic capillaries than that in tissues facilitates internal respiration.

23. Select the correct statement regarding human kidneys.
(1) Left kidney is situated slightly lower than the right kidney on the posterior abdominal wall.
(2) Majority of nephrons in the kidney are juxtamedullary nephrons.
(3) Kidneys contain sensors which can detect increase in blood pressure.
(4) Kidneys can regulate blood pH by reabsorption of H^+ through nephrons.
(5) Kidneys play a role in the production of red blood cells.

24. Neurotransmitters are released into the synaptic cleft in chemical synapses as a response to which of the following?
(1) Increase in Ca^{2+} concentration in the synaptic cleft
(2) Decrease in Na^+ concentration in the synaptic cleft
(3) Increase in K^+ concentration in presynaptic terminal
(4) Increase in Ca^{2+} concentration in presynaptic terminal
(5) Decrease in Na^+ concentration in presynaptic terminal

25. Which of the following mechanoreceptors are present close to the surface of the human skin?

A – Free nerve endings B – Pacinian corpuscles
C – Meissner corpuscles D – Merkel discs

(1) A and B only. (2) C and D only. (3) A, B and C only.
(4) A, C and D only. (5) B, C and D only.

26. Which of the following changes would occur in the human body when deep body temperature drops below the normal body temperature?

	Arterioles in the skin	**Hair erector muscles in the skin**	**Adrenaline level in blood**
(1)	Dilate	Contract	Increase
(2)	Constrict	Relax	Decrease
(3)	Dilate	Relax	Increase
(4)	Constrict	Contract	Increase
(5)	Constrict	Contract	Decrease

[*See page five*

27. Select the correct statement regarding asexual reproduction of animals.
(1) Female workers of honey bees develop through parthenogenesis.
(2) Some platyhelminths reproduce asexually by regeneration.
(3) Budding of *Hydra* relies on mitotic and meiotic cell divisions.
(4) Fragmentation allows some annelids to produce varied genotypes from a single parent.
(5) In changing environmental conditions, asexual reproduction would be more advantageous to cnidarians.

28. Accessory glands associated with the human male reproductive system and features of their secretions are given below.

Gland	Features of the secretion
A – Prostate gland	P – Clear alkaline mucus
B – Bulbourethral glands	Q – Thick, alkaline secretion containing mucus and fructose
C – Seminal vesicles	R – Thin, milky secretion containing citrate and anticoagulant enzymes

Select the response with all correct 'gland - feature of secretion' combinations.
(1) A – P, B – Q, C – R
(2) A – Q, B – R, C – P
(3) A – R, B – Q, C – P
(4) A – Q, B – P, C – R
(5) A – R, B – P, C – Q

29. Some features of three vertebrae of man labelled as P, Q and R observed by a student are given below.
P – A large body and a prominent spinous process
Q – No distinct body or spinous process
R – Articulation facets on the body and transverse processes
P, Q and R would most likely to be respectively
(1) a lumbar vertebra, first cervical vertebra and second cervical vertebra.
(2) a thoracic vertebra, first cervical vertebra and second cervical vertebra.
(3) a lumbar vertebra, second cervical vertebra and a thoracic vertebra.
(4) a lumbar vertebra, first cervical vertebra and a thoracic vertebra.
(5) a thoracic vertebra, second cervical vertebra and a lumbar vertebra.

30. Which of the following processes are present in the temporal bone of man?
(1) Mastoid process and coronoid process
(2) Styloid process and mastoid process
(3) Condyloid process and styloid process
(4) Mastoid process and condyloid process
(5) Coronoid process and condyloid process

31. Which of the following inheritances shows a phenotypic ratio of 9 : 7 in the F_2 generation in a dihybrid cross?
(1) Polyallelism
(2) Recessive epistasis
(3) Pleiotropy
(4) Dominant epistasis
(5) Polygenic inheritance

32. In garden pea, if tall (T) plants, yellow (Y) flowers and round (R) seeds are dominant to short (t) plants, white (y) flowers and wrinkled (r) seeds respectively, according to Mendel's laws what is the probability of getting the offspring with TtRrYY genotype when two plants with genotypes TTrrYy and TtRrYy are crossed?
(1) $\frac{1}{16}$ (2) $\frac{1}{8}$ (3) $\frac{3}{16}$ (4) $\frac{1}{4}$ (5) $\frac{5}{16}$

33. The enzyme used to make cDNA on an mRNA template is
(1) DNA polymerase.
(2) reverse transcriptase.
(3) transcriptase.
(4) helicase.
(5) primase.

[*See page six*

34. What is the role of nucleases in DNA repairing?
(1) Breaking of H bonds between nucleotides in DNA
(2) Identifying mismatched DNA sequences
(3) Filling of gaps using correct nucleotides
(4) Making the DNA strand by the formation of phosphodiester bonds
(5) Cutting of mismatched nucleotide sequences in damaged DNA strands

35. Some vegetation types and the ecosystems where they can be seen in Sri Lanka are given below.

Vegetation type	Ecosystem
A – Stunted vegetation	P – Tropical montane forests
B – Dense scrub layer	Q – Tropical thorn scrubs
C – Thick grass cover	R – Sand dunes
D – Sparse large trees	S – Savanna

Which of the following responses indicates all correct combinations of the vegetation type and the ecosystem where it is found?
(1) A–P, B–S, C–R, D–Q (2) A–P, B–R, C–Q, D–S
(3) A–R, B–S, C–P, D–Q (4) A–R, B–P, C–S, D–Q
(5) A–R, B–P, C–Q, D–S

36. Which of the following statements are correct regarding chickenpox vaccine?
A – It contains live microorganisms which are deliberately weakened for pathogenicity.
B – Repeated immunisation is needed.
C – It mimics an actual infection.
D – It is a subunit vaccine.
(1) A and C only. (2) A and D only. (3) B and C only.
(4) B and D only. (5) A, C and D only.

37. Which of the following combinations of fermentation processes and microorganisms involved in them is/are correct?

Fermentation process	Microorganism
A – Sucrose → Ethanol	*Gluconobacter* sp.
B – Lactose → Lactic acid	*Bacillus subtilis*
C – Sucrose → Citric acid	*Aspergillus niger*
D – Ethanol → Acetic acid	*Streptococcus* sp.

(1) A only. (2) B only. (3) C only.
(4) D only. (5) C and D only.

38. Methods of solid waste management and some of their outcomes are given below.

Method	Outcome
A – Sorting and recycling	P – Reduction of breeding sites of Dengue vectors
B – Decomposition	Q – Reducing the volume of solid waste
C – Sanitary land filling	R – Generation of electricity

Select the most appropriate response with all correct 'method - outcome' combinations.
(1) A–R, B–P, C–Q (2) A–P, B–R, C–Q
(3) A–P, B–P, C–R (4) A–Q, B–P, C–R
(5) A–R, B–Q, C–P

39. Two methods that preserve food by destroying microorganisms are
(1) drying and use of chemicals. (2) chilling and smoking.
(3) salting and use of chemicals. (4) freezing and sugaring.
(5) radiation and heat treatment.

[*See page seven*

40. Which of the following are associated with the transmission of filariasis within a community?

A – Frequency of human vector contact
B – Density of microfilariae in infected mosquito
C – Number of infected persons
D – Characteristics of vector

(1) A and D only. (2) A, B and C only. (3) A, B and D only.
(4) A, C and D only. (5) A, B, C and D.

- **For each of the questions 41 to 50, one or more of the responses is/are correct. Decide which response/responses is/are correct and then select the correct number.**

If only (A), (B) and (D) are correct ..... (1)
If only (A), (C) and (D) are correct ..... (2)
If only (A) and (B) are correct ..... (3)
If only (C) and (D) are correct ..... (4)
If any other response or combination of responses is correct ..... (5)

Directions summarised				
(1)	(2)	(3)	(4)	(5)
(A), (B), (D) correct.	(A), (C), (D) correct.	(A), (B) correct.	(C), (D) correct.	Any other response or combination of responses correct.

41. Which of the following statements regarding cell junctions is/are correct?

(A) Animal embryos have cell junctions which allow the passage of ions.
(B) Tight junctions connect the plasma membranes of adjacent cells forming a continuous seal which prevents leakage of extracellular fluid.
(C) Plasmodesmata are nonliving connections between cell walls of adjoining plant cells.
(D) Desmosomes allow exchange of signals and materials between adjacent cells.
(E) Gap junctions attach the cytoskeletons of adjoining cells by intermediate filaments.

42. Which of the following combinations of some organisms and the time periods they were living on earth is/are correct?

(A) Early microorganisms – About 3.5 billion years ago
(B) First photosynthetic organisms – About 2.7 billion years ago
(C) First eukaryotes – About 2.6 billion years ago
(D) Oldest protists – About 1.2 billion years ago
(E) Ancestors of arthropods – About 700 million years ago

43. In monocot leaves,

(A) two cell layers may sometimes be present in palisade mesophyll.
(B) old epidermis may be replaced by thick cuticle.
(C) chloroplasts are abundant in all mesophyll cells.
(D) veins are parallelly arranged.
(E) stomata are mainly found in the lower epidermis.

44. Which of the following blood group/groups can be received by a person with B Rh^+ blood group during a blood transfusion?

(A) B Rh^- (B) O Rh^- (C) AB Rh^- (D) O Rh^+ (E) AB Rh^+

45. Which of the following 'function-structure' combinations regarding human brain is/are correct?

Function	**Structure**
(A) Regulating appetite	Medulla oblongata
(B) Controlling auditory reflexes	Mid brain
(C) Coordinating voluntary muscle movements	Cerebellum
(D) Controlling autonomic nervous system	Hypothalamus
(E) Regulating sleep and wake cycles	Thalamus

[*See page eight*

46. Which of the following statements regarding oogenesis of a woman is/are correct?
(A) Primodial germ cells originate from the yolk sac of embryo.
(B) Oogonia are formed by primodial germ cells through mitotic divisions.
(C) Primary oocytes complete meiosis I before birth.
(D) Meiosis II of the secondary oocyte starts at puberty and is arrested at prophase.
(E) Ovum and two polar bodies are formed when the secondary oocyte completes meiosis II with the penetration of a sperm.

47. DNA sequencing
(A) is a process used to determine the precise order of the bases in the DNA molecule.
(B) cannot be applied in paternity testing.
(C) helps to diagnose cancer.
(D) is helpful in early diagnosis of carriers of genetic disorders.
(E) has revealed the absence of multiple copies of genes in human genome.

48. Which of the following statements regarding microorganisms is/are correct?
(A) Fungal hyphae use organic chemicals as the source of energy.
(B) Mycoplasma and yeast reproduce by budding and fission.
(C) *Acetobacter* sp. can grow only in aerobic environments but can generate energy through fermentation.
(D) Cyanobacteria carry thick-walled heterocysts to survive during unfavourable conditions.
(E) Purple sulphur bacteria are chemoautotrophs that use CO_2 as the source of carbon.

49. Invasive alien plant species
(A) alter ecosystem values.
(B) are confined to areas with little environmental variation.
(C) may encourage wild fires.
(D) may prevent germination of seeds of other plants.
(E) do not affect genetic diversity but reduce ecosystem diversity.

50. This question is based on the following plants of Sri Lanka.

P – *Salicornia*	Q – Kaluwara/Karun-kaali	R – Palu/Paalai
S – Gini-andara/Vidattal/Vindattai	T – Heeressa/Pirandai	U – Tassock grass
V – Keena/Pongu	W – Weera/Virai	X – Walkurudu/Kaatu karuwa

Plants that are found in three ecosystems arranged according to increasing annual rainfall in correct sequence are
(A) S, R and U. (B) T, Q and X. (C) S, U and W.
(D) P, W and V. (E) P, V and Q.

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AL/2024/09/E-II

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2024
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2024
General Certificate of Education (Adv. Level) Examination, 2024

ජීව විද්‍යාව	II
உயிரியல்	II
Biology	**II**

09 E II

පැය තුනයි	
மூன்று மணித்தியாலம்	
Three hours	

අමතර කියවීම් කාලය	-	මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம்	-	10 நிமிடங்கள்
Additional Reading Time	-	**10 minutes**

Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Index No. : .....

Instructions:

- ✻ *This question paper consists of* **10** *questions in* **11** *pages.*
- ✻ *This question paper comprises Part* **A** *and Part* **B.** *The time allotted for* ***both parts*** *is* ***three hours.***

PART A — Structured Essay (Pages 2 - 10)

- ✻ *Answer* ***all four*** *questions on this paper itself.*
- ✻ *Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and extensive answers are not expected.*

PART B — Essay (Page 11)

- ✻ *Answer* ***four*** *questions only. Use the papers supplied for this purpose. At the end of the time allotted for this paper, before handing over to the supervisor tie the two parts together so that Part* **A** *is on the top of Part* **B.**
- ✻ *You are permitted to remove only Part* **B** *of the question paper from the examination hall.*

For Examiners' Use Only

Part	Question No.	Marks
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
	8	
	9	
	10	
Total		

Total

In Numbers	
In Letters	

Code Numbers

Marking Examiner 1	
Marking Examiner 2	
Marks checked by	
Supervised by	

[see page two

Part A - Structured Essay

*Answer **all** questions on **this paper itself.***

*(Each question carries **100** marks.)*

Do not write in this column

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.

.....

(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 cofactors.

.....

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

.....

.....

.....

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

.....

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

.....

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

Photosystem I : .....

Photosystem II : .....

(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.

.....

Do not write in this column

100

[see page four

Do not write in this column

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?

.....

(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.

.....

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

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(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?

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(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?

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Do not write in this column

100

[see page six

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

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.....

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

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(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.

.....

(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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Do not write in this column

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

.....

(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?

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(iii) What is perceived as sound in hearing?

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

.....

.....

(b) State the reasons for hypothyroidism in humans.

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(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?

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(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.

.....

[see page eight

Do not write in this column

(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.

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(v) (a) What is a gene?

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.....

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

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100

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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Do not write in this column

(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?

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

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(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.

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[*see page ten*

Do not write in this column

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

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(b) How are mycorrhizae beneficial to plants?

.....

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.....

(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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100

* *

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2024
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2024
General Certificate of Education (Adv. Level) Examination, 2024

ජීව විද්‍යාව II
உயிரியல் II
Biology II

09 E II

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

* * *

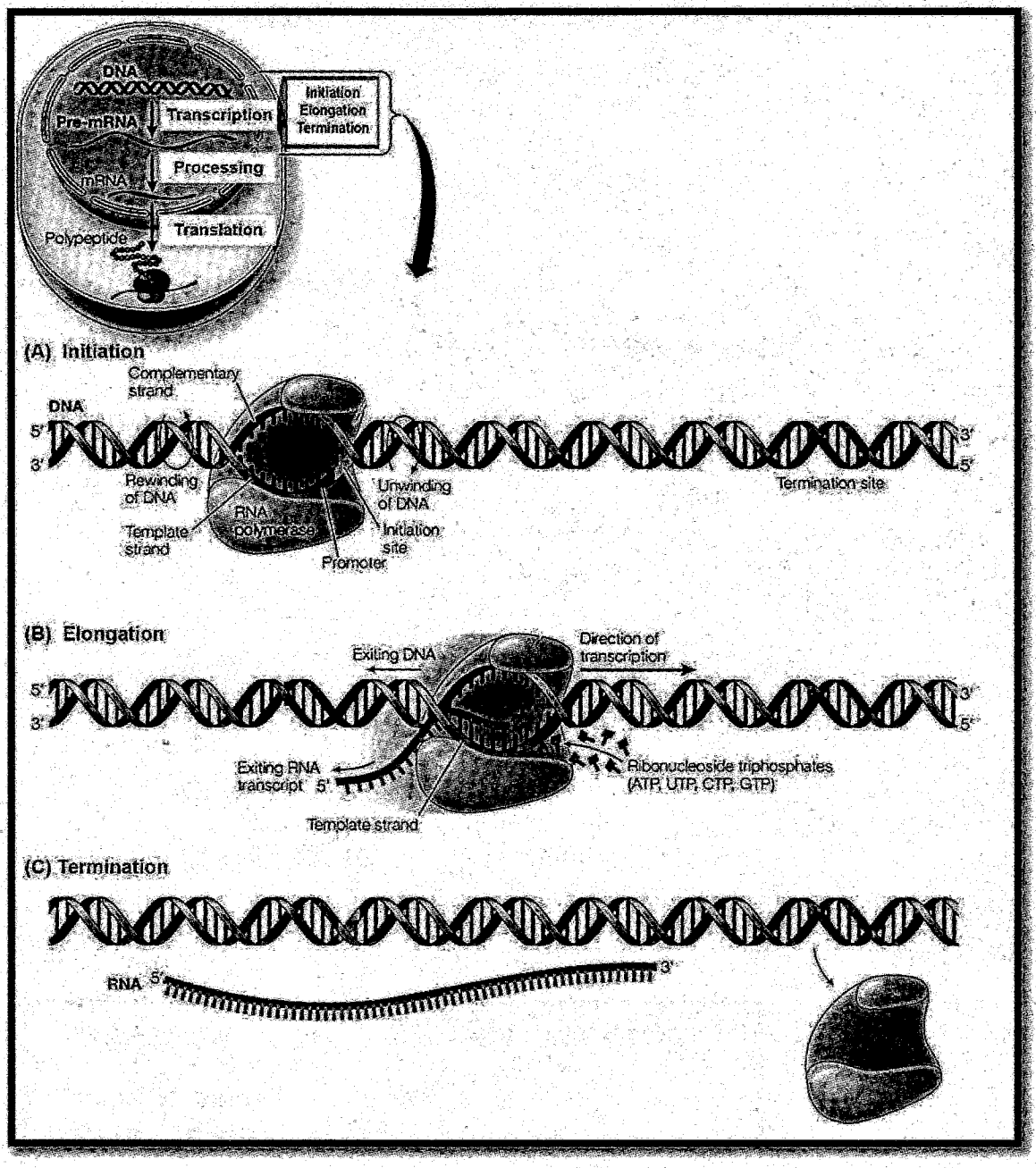
Confidential

Department of Examinations – Sri Lanka

G.C.E. (A/L) Examination – 2024

09 – Biology

Marking Scheme



This has been prepared for the use of marking examiners. Some changes would be made according to the views presented at the Chief Examiners' meeting.

Amendments to be included

G.C.E. (A/L) Examination - 2024
09 - Biology
Distribution of Marks

- Paper I - 1 x 50 = 50

Paper II

Part A - Structured Essay (Answer all four questions)

Question No. 01	-	100
Question No. 02	-	100
Question No. 03	-	100
Question No. 04	-	100

100 x 4 = 400

Part B - Essay (Answer four questions only)

Question No. 05	-	150
Question No. 06	-	150
Question No. 07	-	150
Question No. 08	-	150
Question No. 09	-	150
Question No. 10	-	150

150 x 4 = 600

Total Marks = 400 + 600 = 1000

Paper II Marks = 1000
Paper I Marks = 50

Final Marks $= 50 + \left(\frac{1000}{20}\right)$

Common Techniques of Marking Answer Scripts.

It is compulsory to adhere to the following standard method in marking answer scripts and entering marks into the mark sheets.

1. Use a red color ball point pen for marking. (Only Chief/Additional Chief Examiner may use a mauve color pen.)

2. Note down Examiner's Code Number and initials on the front page of each answer script.

3. Write off any numerals written wrong with a clear single line and authenticate the alterations with Examiner's initials.

4. Write down marks of each subsection in a △ and write the final marks of each question as a rational number in a ▭ with the question number. Use the column assigned for Examiners to write down marks.

Example: **Question No. 03**

(i) ..... √ 4/5

(ii) ..... √ 3/5

(iii) ..... √ 3/5

03 (i) $\frac{4}{5}$ + (ii) $\frac{3}{5}$ + (iii) $\frac{3}{5}$ = $\frac{10}{15}$

MCQ answer scripts: (Template)

1. Marking templets for G.C.E.(A/L) and GIT examination will be provided by the Department of Examinations itself. Marking examiners bear the responsibility of using correctly prepared and certified templates.

2. Then, check the answer scripts carefully. If there are more than one or no answers Marked to a certain question write off the options with a line. Sometimes candidates may have erased an option marked previously and selected another option. In such occasions, if the erasure is not clear write off those options too.

3. Place the template on the answer script correctly. Mark the right answers with a '√' and the wrong answers with a '0' against the options column. Write down the number of correct answers inside the cage given under each column. Then, add those numbers and write the number of correct answers in the relevant cage.

Structured essay type and assay type answer scripts:

1. Cross off any pages left blank by candidates. Underline wrong or unsuitable answers. Show areas where marks can be offered with check marks.

2. Use the right margin of the overland paper to write down the marks.
3. Write down the marks given for each question against the question number in the relevant cage on the front page in two digits. Selection of questions should be in accordance with the instructions given in the question paper. Mark all answers and transfer the marks to the front page, and write off answers with lower marks if extra questions have been answered against instructions.

4. Add the total carefully and write in the relevant cage on the front page. Turn pages of answer script and add all the marks given for all answers again. Check whether that total tallies with the total marks written on the front page.

Preparation of Mark Sheets.

Except for the subjects with a single question paper, final marks of two papers will not be calculated within the evaluation board this time. Therefore, add separate mark sheets for each of the question paper. Write paper 01 marks in the paper 01 column of the mark sheet and write them in words too. Write paper II Marks in the paper II Column and wright the relevant details.

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இலங்கைப் பரீட்சைத் திணைக்களம்

අ.පො.ස. (උ.පෙළ) විභාගය / க.பொ.த. (உயர் தர)ப் பரீட்சை - 2024

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

✪ විශේෂ උපදෙස් / விசேட அறிவுறுத்தல் :

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

මුළු ලකුණු / மொத்தப் புள்ளிகள் — × 50 = 5(

Part A - Structured Essay

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

(a) Serum albumin : Transport fatty acids **01 pt**

(b) Ovalbumin : Storage in eggs **01 pt**

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

Because they have an alkaline (amino) group and an acidic (carboxyl) group within the same molecule / because they have an alkaline nature and acidic nature in the same molecule. **01 pt**

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

- Animal fats do not contain double bonds / made up of saturated fatty acids while plant fats contain (one or more) double bonds / made up of unsaturated fatty acids.
- Animal fats are solid at room temperature while plant fats are liquid at room temperature **02 pts**

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

Keratin **01 pt**

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

Peptidoglycan **01 pt**

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

The (magnified) image of the specimen produced by the objective (lens) **01 pt**

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

Heavy metals **01 pt**

(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 :
- Synthesis of phospholipids
- Production of transport vesicles **02 pts**

(b) By SER only :
- Detoxification
- Synthesis of oils / steroids
- Storage of Ca^{2+} ions
- Metabolism of carbohydrates (any two) **02 pts**

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

Collagen **01 pt**

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

Transporting residue material out of the cell : Lysosomes

Cytoplasmic streaming : Cytoskeleton **02 pts**

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

Golgi apparatus **01 pt**

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

Metaphase **01 pt**

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

Nerve cells, Muscle cells **02 pts**

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

Breakdown of glucose to pyruvate : Cytosol

Production of oxaloacetate : Matrix of mitochondria **02 pts**

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

Ethyl alcohol fermentation : Acetaldehyde

Lactic acid fermentation : Pyruvate **02 pts**

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

Non proteinaceous compounds that are essential for the catalytic activities of certain enzymes **01 pt**

(b) Name **two** inorganic cofactors.

Zn^{2+}, Fe^{2+}, Cu^{2+}, K^{+} (any two) **02 pts**

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

- Acts as an allosteric activator
- Binds to the regulatory site of the enzyme (and stimulates the production of ATP)
- Stabilises the shape with functional activities. **03 pts**

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

- I_2 solution
- I_2 / KI (I_2 - KI) (any one) **01 pt**

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

Thylakoid membranes **01 pt**

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

Photosystem I : 700 nm

Photosystem II : 680 nm **02 pts**

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

- Occurs in PS I only.
- NADPH is not produced / only ATP is produced.
- Oxygen is not released. **03 pts**

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

Palaeozoic, Mesozoic , Cenozoic **03 pts**

40 pts x 2½ marks
Total = 100 marks

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

- Presence of histones associated with DNA
- Presence of introns in genes
- Initiator amino acid in protein synthesis is methionine
- Presence of several kinds of RNA polymerases
- Growth is not inhibited by antibiotics / streptomycin / chloramphenicol
- Unbranched hydrocarbons in membrane lipids (any five) **05 pts**

(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**	
Alginic acid	-	*Sargassum*	**02 pts**
Pectin	-	Diatoms	**02 pts**
Silica	-	Diatoms	**02 pts**

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

Megaspore , Megasporangium , Integument **03 pts**

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

- Cylindrical body with tapering ends
- Sensory papillae in the anterior end
- No segmentation / unsegmented body
- Presence of excretory pores in the body wall
- No special locomotory structures
- Bilateral symmetry
- No (distinct) cephalization (any five) **05 pts**

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

- Reduce water loss
- Reflect excess light **02 pts**

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

- Cytosol
- Plasmodesmata **02 pts**

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

SO_4^{2-} / Sulphate ions **01 pt**

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

To prevent desiccation of gametes **01 pt**

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

Specialized plastids containing (dense) starch grains **01 pt**

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

- Multinucleated / Many nuclei per cell
- Striated / Striations
- Long cells
- Cylindrical cells (any three)

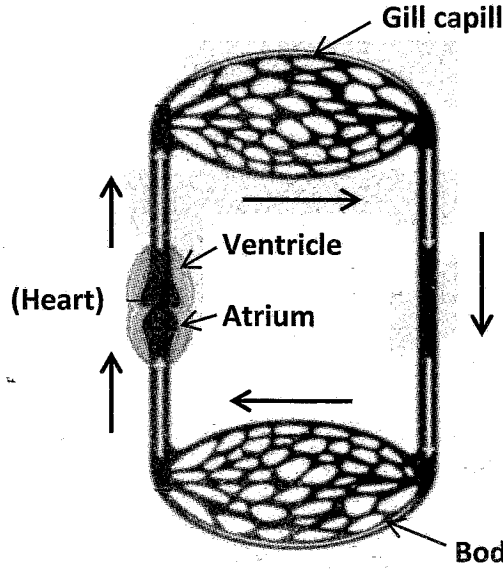
03 pts

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

- Mixing food with saliva
- Making food bolus
- Facilitating swallowing
- Pushing the food bolus into the posterior part of the oral cavity and into the pharynx

05 pts

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



Labelled diagram **01 pt**
(No marks for flow chart)

Direction of blood flow **01 pt**

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

Via two large lymphatic ducts which drain into (two) veins at the base of neck **02 pts**

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

(Inferior vena cava) → Right atrium → Right ventricle → Pulmonary artery
↓
(Lung capillaries)
↓
(Aorta) ← Left ventricle ← Left atrium ← Pulmonary veins

01 pt

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

To transport oxygen from respiratory surface to tissues / organs as oxygen is less soluble in watery medium / blood **01 pt**

40 pts x 2½ marks
Total = 100 marks

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

Gas exchange through body surface is not adequate to fulfil the energy requirements as the body size is increased and becomes complex. **02 pts**

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

Vital capacity is the maximum volume of air which can be inhaled and exhaled whereas total lung capacity is the maximum volume of air that lungs can hold. **02 pts**

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

No Marks

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

Energy cost for production (for excretion) is less (compared to other wastes) **01 pt**

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

Osmosis **01 pt**

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

Coelom **01 pt**

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

Gradual loss of kidney function over time **01 pt**

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

Diabetes **01 pt**

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

Brain and ventral nerve cord with segmented ganglia **01 pt**

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

Pons Varolii : Hind brain

Pineal body : Forebrain **02 pts**

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

Cerebral cortex **01 pt**

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

Sensory receptor → afferent / sensory neuron → Inter neuron → Effector/tissue/organ ← Efferent/motor neuron **01 pt**

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

Schizophrenia **01 pt**

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

Ganglion cells, bipolar cells / bipolar neurons, photoreceptors / rods and cones, pigmented (epithelial) cells. **01 pt**

epithelium

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

Due to fusion of left, middle and right of visual field images from two eyes in the occipital lobe of cerebrum

(if occipital lobe is not mentioned consider as **01 pt**) **02 pts**

(iii) What is perceived as sound in hearing?

Nerve impulses generated as a result of transduction of pressure waves produced in the surrounding air by vibrating objects **01 pt**

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

Ductless gland consisting of (group of) specialized cells which secrete hormones / chemical messengers **01 pt**

(b) State the reasons for hypothyroidism in humans.

- Insufficient secretion of thyroid hormones / T_3 and T_4
- Lack of TSH production (by anterior pituitary)
- Iodine deficiency (any two) **02 pts**

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

By stimulating Leydig cells to produce testosterone and other androgens **02 pts**

(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?

- Thickening of the endometrium
- Enlarging arteries in the endometrium
- Growth of endometrial glands **03 pts**

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

Progesterone, Estradiol / Estrogen **02 pts**

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

Allantois **01 pt**

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

Genital Herpes **01 pt**

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

Squids **01 pt**

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

(Contribute to) exposing myosin binding sites on actin (molecules) **01 pt**

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

- Provide resonance to voice
- Reduce weight of skull **02 pts**

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

(Hinge) joints between metacarpels and phalanges **01 pt**

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

Hip joint / ball and socket joint formed by head of femur with acetabulum (of the hip bone of pelvis) **01 pt**

(v) (a) What is a gene?

Basic unit by which genetic information is passed from parents to offspring / Nucleotide sequence of DNA at a specific locus on a chromosome / Basic physical and functional unit of inheritance **01 pt**

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

Inducing desirable mutations using chemical or physical agents **02 pts**

40 pts x 2½ marks
Total = 100 marks

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 : Missense mutation

Z : Silent Mutation **02 pts**

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

CGUUUUUUACCUAUA **01 pt**

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

Vehicle that carries the required DNA into a host for multiplication or cloning. **01 pt**

(b) Give **two** examples for cloning vectors.

Plasmid, Bacteriophage **02 pt**

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

Because the materials available for living organisms are limited/After the death of an organism, materials should be made available to other organisms **01 pt**

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

Desert, Chaparral, Temperate broad leaf forest. **03 pts**

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

- All living beings have the right to live
- Humans/we have no right to decide which species should exist **02 pts**

(b) What is the purpose of Kyoto protocol?

Reduction of emission of greenhouse gases **01 pt**

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

(a) Hospital waste : Incineration **01 pt**

(b) Air in operating theatres : UV radiation / Ultraviolet radiation **01 pt**

(c) Enzyme solutions with microbial cells larger than 0,45 μm :

Membrane filtration **01 pt**

(d) Inoculation loops : Direct flaming **01 pt**

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

Nitrobacter **01 pt**

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

Aerobic , Facultative anaerobic **02 pts**

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

Methylene blue/ Crystal violet / Safranin **01 pt**

(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.

- Expose both sets of nutrient agar plates / petri dishes to air for (about) 10 minutes.
- Close one set of petri dishes after rinsing with phenol.
- Close / keep closed the other set.
- Incubate for 24-48 hours and observe for number of colonies (in both sets)

(All 4 points should be in correct order. otherwise no marks) **04 pts/ 0 pt**

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

Consumption of methane before it reaches the atmosphere / Consumption (80% of) methane generated in the ocean **01 pt**

(b) How are mycorrhizae beneficial to plants?

- Increasing the area of nutrient / mineral / water uptake.
- Reaching small pores in soil where roots cannot reach.
- Increasing the uptake of immobile nutrients / P / Zn / Cu **03 pts**

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

Escherichia coli
Saccharomyces cerevisiae **02 pts**

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

Accumulation of excessive amounts of phosphates and nitrates into water bodies.
(If only eutrophication is written consider as **01 pt.)**

02 pts

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

To remove toxic chemicals **01 pt**

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

- Fecal contamination
- Potential Contamination by / presence of pathogenic microorganisms (any one) **01 pt**

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

Food stored at 4°C : Psychrophilic bacteria
Food containing sugar : Osmophilic / Xerophilic molds / yeast **02 pts**

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

By producing Aflatoxins **01 pt**

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

- To monitor blood pressure
- To monitor blood oxygen levels
- To monitor hormone concentrations (Any two) **02 pts**

40 pts x 2½ marks
Total = 100 marks

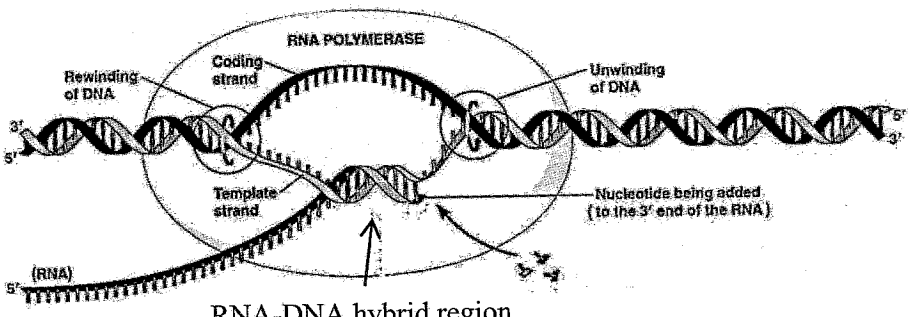
Paper II : Part B - Essay

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

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

(a)

1. This is the initial process of polypeptide synthesis.
2. During this process nucleotide sequence of DNA is copied into mRNA. There are three steps in this process.
3,4,5. They are initiation, elongation and termination.
6. Initiation occurs at a specific site/promoter site/promoter.
7. This site includes a transcription initiation site and other nucleotides.
8. One DNA strand acts as the template (for transcription).
9,10. RNA polymerase/polymerizing enzyme binds to the promoter site, in correct orientation and
11. unwinds the two DNA strands.
12. (During elongation) RNA polymerase starts adding/ adds complementary ribonucleotides on/against the DNA template
13. in 5' to 3' direction.
14. RNA polymerase moves forward and
15,16,17. DNA double strand unwinds, exposing DNA template, allowing pairing with ribonucleotides.
18. This is continued until RNA polymerase reaches the (transcription) termination site.
19. Two DNA strands rewind at the other end.
(When new mRNA/pre mRNA is synthesized, RNA polymerase releases the DNA template / RNA polymerase falls off).



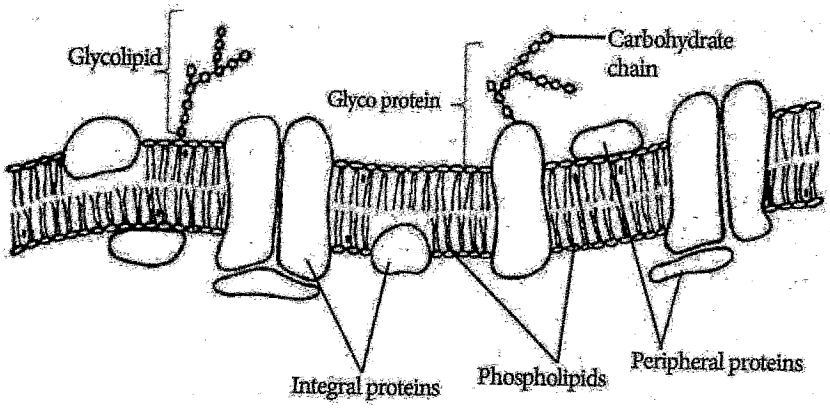
RNA-DNA hybrid region

Fully labeled correct diagram: 5 marks
Partially labeled correct diagram: 3 marks
Unlabeled diagram: 0 marks

(b)

1. Structure of plasma membrane is explained by fluid mosaic model.
2. Plasma membrane is mainly made up of phospholipids and proteins.
3. Phospholipids are arranged in a bilayer and
4, 5. have (hydrophilic) heads which face outward and
6,7. (hydrophobic) tails which face inward.
8,9. Protein molecules/integral proteins are embedded in the membrane / lipid bilayer randomly.
10,11. Some (integral proteins) penetrate all the way through the membrane and they are called transmembrane proteins.
12. (Most of) the transmembrane proteins have (hydrophilic) channels.

13. Some (integrated) proteins penetrate only part of the way into membrane/partially embedded.
14,15,16. Some proteins are not embedded (in the lipid bilayer) and are loosely bound; they are called peripheral proteins
17,18. (Short branched) carbohydrates bind to proteins and lipids and
19,20. form glycoproteins and glycolipids.



Fully labeled correct diagram: 5 marks
Partially labeled correct diagram: 3 marks
Unlabeled diagram: 0 marks

19+20 = 39 points
Any 35 points x 4 = 140 marks
Two diagrams: 5x2 = 10 marks
Maximum 150 marks

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

1. Some defence mechanisms already exist in plants.
2. Some are induced (by pathogens and pests).
3, 4. These are structural and chemical mechanisms.
Defence mechanisms include the following:
5, 6. Presence of epidermis with tightly packed cells;
7. Presence of cuticle/wax layers;
8, 9. Amount and quality of wax;
10, 11. Structure and thickness of epidermal cell walls;
12,13,14. Size, location and shape of stomata;
15,16,17. Presence of pricks, thorns, and trichomes;
18, 19. Formation of cork and abscission layer;
20, 21. Containing waxy (hydrophobic) material known as suberin;
22. Presence/deposition of resins (in heart wood);
23. Morphological / structural changes in the cell wall;
24. Presence/production of secondary metabolites
25, 26. such as toxic compounds, e.g. cyanogenic glycosides,
27, 28. Alkaloids e.g. nicotine,
29, 30. Phenolic compounds, e.g. flavonoids,
31, 32. Lignin, tannin,
33,34,35. Terpenoids e.g. azadiractin, lectin.
36,37,38. Production of enzymes that degrade fungal cell walls or damage insect organs.

Any 37 points x 4 =148 marks
If more than 37 points written add 2 marks
Maximum 150 marks

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

(b) Explain how digestion is regulated in man.

(a)

1, 2. Secretes / synthesizes bile which contains bile salts.
3, 4. Helps in digestion and absorption of fats
5. through emulsification.
6. Regulates distribution of nutrients (in the body).
7, 8. Stores excess glucose in blood as glycogen.
9. Breaks down glycogen (back) to glucose when required.
10. Stores fat soluble vitamins / vitamins A, D, E and K,
11,12. (some) water soluble vitamins / vitamin B_{12} and iron (Fe) / copper (Cu).
13,14. Stores fat and breaks down (stored) fat when needed.
15. Synthesizes nonessential amino acids.

(b)

1,2. Done by nervous regulation and endocrine regulation
3. Nervous regulation is done through nervous reflexes.
4. Examples: When food reaches mouth, saliva is secreted;
5. When food reaches stomach, its wall is stretched,
6,7. stimulating the release of gastric juice and churning
8. and release of gastrin.
9. Gastrin stimulates production of gastric juices.
10,11. Fatty acids and/or amino acids in chyme
12,13,14. stimulates/triggers release of cholecystokinin and secretin from duodenum.
15,16. Cholecystokinin stimulates/triggers release of bile from gall bladder
17,18. and digestive enzymes from pancreas.
19.20. Secretin stimulates release of HCO_3^- from pancreas.
21. When chyme is rich in fat, digestion in stomach slows down due to
22,23. high levels of cholecystokinin and secretin
24,25. which inhibit secretions of gastric juice and peristalsis.

15 + 25 = 40 points
Any 37 points X 4 =148 marks
If more than 37 points written add 2 marks
Maximum 150 marks

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.

(a)

Second trimester

1. Organ systems completely developed.
2. Foetus assumes distinctively human features.
3. Foetus grows to (about) 30 cm in length.
4. Foetus is very active.

Third trimester

5. Foetus grows rapidly.
6. Most organ systems become fully functional.
7, 8. Foetus grows to (about) 50 cm in length, and weighs (about) 3-4 kg.
9, 10. Foetus fills the space within the uterus, (and therefore) foetal activity / movement decreases.

(b)

1,2,3. Modern reproductive technology includes hormone therapy, surgery, and assisted reproductive technology.
4,5. Hormone therapy is used to increase sperm production in infertile males, and egg production in infertile females.
6,7. Ducts in the reproductive system which are improperly formed, or blocked are corrected by surgery.
8.9. In vitro fertilization / IVF is a series of procedures used to assist with / allow conception of a child.
The IVF process involves
10,11. removal of oocyte(s) from an ovary, and obtaining sperm (from a male) and
12,13. allow fertilization, under laboratory conditions.
14,15. Fertilized eggs are incubated, until they reach (at least) 8 cells and
16,17. embryos are implanted in a woman's uterus/transferred to woman's uterus for implantation, for continuation of its development.
18. As acrosome reaction has to take place
19,20. thousands of sperm / 50000-100000 sperm are needed per one oocyte, to fertilize one egg/to achieve fertilization.
21,22. Intra-cytoplasmic Sperm Injection/ICSI, is a method used to address male infertility.
23, 24. This is done if mature sperm are defective, or low in numbers (in such males),
25, 26,27. Whole sperm, or a spermatid nucleus is injected (directly) into the cytoplasm of an oocyte, which is removed from a woman's ovary.
28,29. Fertilized egg is returned to the (woman's) uterus, for implantation.
30. (ICSI) needs only one selected sperm per oocyte.

10 + 30 = 40 points
Any 37 points X 4 =148 marks
If more than 37 points written add 2 marks
Maximum 150 marks

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

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

(a)

1,2. It is based on observations and their interpretations.
Observations:
3. Populations vary in (inherited) traits/characters. / Members of a population show genetic variations.
4. More offspring than the environment can accommodate are produced (overproduction).
Interpretations:
5,6. Certain traits are capable of better survival/have high potential for survival and reproduction.
7. They produce more offspring and
8,9. the abundance of favourable characters in the population is increased (over generations), due to favourable variations / variations in abilities for survival and reproduction.
10,11,12. Favorable characters are protection/escaping from predators, tolerating physical, and stress conditions,
13,14. obtaining food, resistance to disease,
15,16. fertilization probability, and number of offspring produced.

17. There is competition (among individuals) and
18. fittest individuals survive/survival of the fittest.
19. Natural selection of favourable traits occurs.
20. (Hence) this theory is also termed as the theory of natural selection.

(b)

1. Main reason/factor is the emission of greenhouse gases (GHGs) (into atmosphere) / increase in atmospheric concentration of GHGs.
2. This happens due to emission of CO_2 / increase in CO_2 content in atmosphere
3,4,5. due to burning of fossil fuels, solid waste and forests.
6. Emission of CH_4 / increase in CH_4 content
7. due to anaerobic decomposition of manure / waste management,
8,9. cattle farming / enteric fermentation and paddy cultivation;
10. Emission of N_2O / increase in N_2O content
11. due to fertilizer production / fertilizer use,
12. nitric acid production, and
13. fossil fuel combustion in internal combustion engines.
14. Emission /increase in content of industrial gases / PFCs / perfluorocarbons / HFCs / Hydrofluorocarbons / SF_6 / Sulphur hexafluoride;
15. Increase in /suspension of black carbon particles in lower atmosphere
16. due to incomplete combustion of fossil fuels/other organic matter.
17. Reduction of carbon sequestration / removal of CO_2 from atmosphere
18. due to deforestation / reduction in vegetation cover,
19,20. destroying of phytoplankton, due to depletion of ozone layer.

20 + 20 = 40 points
Any 37 points X 4 =148 marks
If more than 37 points written add 2 marks
Maximum 150 marks

10. Write short notes on the following.

(a) Human sex linked characteristics

(b) Prions

(c) Applications of stem cells

(a) Human sex linked characteristics

1. These are the characters carried on / expressed by sex chromosomes /X and Y chromosomes.
2. Characters expressed by/carried on X chromosomes are X linked characters and
3. those genes are (called) X-linked genes.
4. Characters expressed by/carried on Y chromosome are Y linked characters and
5. those genes are (called) Y-linked genes.
6. In females X-linked recessive characters / disorders are expressed (only) in homozygous condition and
7. In males, even one X-linked recessive allele is expressed.
8,9. Examples are red green colour blindness and haemophilia.
10. In red green colour blindness, perceiving differences in red and green colour is difficult.
11,12. In haemophilia, blood clot formation (during an injury) is delayed, due to absence of (one or more) proteins required for blood clotting.
13,14. Y linked characters/ disorders are transferred and expressed only in males.
15. e.g. inability to produce normal sperm

(b) Prions

1. Size is smaller than viruses.
2, 3. Prions are proteinaceous, infectious particles.
4. They do not have nucleic acids.
5. They can replicate with the help of a host's gene that codes the prion protein.
6,7,8. Prions cause neurological diseases in some birds and mammals.
9. Example: Transmissible Spongiform Encephalopathies (TSEs) / developing large vacuoles in brain giving sponge like appearance,
10. Mad cow disease,
11. Creutzfeldt-Jakob Disease (CJD) (in man).
12. Prions are involved in human to human disease transmission which occurs due to
13. transfusion of infected blood and
14. prion infected organ/tissue transplantation.

(c) Applications of stem cells

1. (Growing healthy) stem cells are used to identify/understand birth defects and
2. to treat birth defects.
3. Used in genetic manipulation (for delivering genes) / in gene therapy.
4. creating whole tissues in the laboratory/tissue engineering and
5. repairing damaged tissues/ heart muscles and
6. repairing damaged spinal neurons.
7. Blood stem cells / haemopoietic stem cells (taken from the bone marrow of a healthy immunologically capable donor) are used to replenish bone marrow in leukemia patients.
8,9. These are used to treat Stroke, Heart disease,
10,11. Parkinson disease, Alzheimer's disease, and
12. Diabetes etc.

15 +14+12 = 41 points
Any 37 points X 4 =148 marks
If more than 37 points written add 2 marks
Maximum 150 marks

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