



ഗംപാ ഡെൽറ്റാ മെഡിക്കൽ സൊസൈറ്റി

Gampaha Medical Students' Association



අධ්യാപന പොද്ഡ සහතික പත්‍ර (උසස් පෙළ) විභාග 2021

General Certificate of Education (Adv. Level) Examination 2021

ජීව විද්‍යාව I
Biology I

Biology Model Paper

පැය දෙකයි
Two hours

- ❖ Answer all questions.
- ❖ In each of the questions 1 to 50, pick one of the alternatives from (1), (2), (3), (4), (5) which is correct or most appropriate.
- ❖ For each of the questions from 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.

(1)	(2)	(3)	(4)	(5)
A, B, D Correct	A, C, D Correct	A, B Correct	C, D Correct	Any other response

- Select the correct statement about characteristic features of organisms.
 - All changes happen during lifetime of an organism is called development.
 - Metabolism is always anabolism or catabolism.
 - The organized nature in organisms is higher in molecular level than organ level.
 - Only nervous and muscle systems are important for movement of organisms.
 - The size of bacteria varies around 0.25 nm–2 nm.
- Which out of following is always a protein?
 - Casparian strip.
 - Angiotensin II.
 - Progesterone.
 - Glycogen.
 - Epitopes.
- How many amino acids should be coded from a DNA double strand containing 6000 nucleotides during protein synthesis?

(1) 1999 (2) 1000 (3) 2000 (4) 999 (5) 6000

4. Choose the answer where the structure doesn't match with the function.
- (1) Rough Endoplasmic Reticulum – Synthesis of glycoproteins.
 - (2) Smooth Endoplasmic Reticulum – Synthesis of glycoproteins.
 - (3) Lysosomes – Phagocytosis.
 - (4) Glyoxisomes – Convert fatty acids to sugars.
 - (5) Mitochondria – Photorespiration.
5. What is the correct order of events happening during interphase of eukaryotic cell cycle?
- a. Synthesis of histone proteins.
 - b. Synthesis of proteins required for mitosis.
 - c. Synthesis of proteins required for S phase.
 - d. Synthesis of chromatin.
- (1) b, c, a, d
 - (2) c, a, d, b
 - (3) c, d, b, a
 - (4) a, b, c, d
 - (5) d, a, b, c
6. Select the correct statement about photosystems.
- (1) Photosystems are located within the stroma of chloroplast as a complex of protein molecules, organic molecules and chlorophyll molecules.
 - (2) ATP synthesis is possible around photosystem I.
 - (3) The reaction center of photosystem I effectively absorbs light rays of 680 nm wave length.
 - (4) During photo-hydrolysis around photosystem I, O_2 , electrons and H^+ ions are produced.
 - (5) Primary electron acceptors are located within light harvesting complexes of photosystems.
7. Select the correct statement about reactions in cellular respiration.
- (1) The volume of O_2 utilized is equal to the volume of CO_2 evolved, when protein is used as the respiratory substrate.
 - (2) The amount of usable energy in a NADH molecule is less than that of a $FADH_2$ molecule.
 - (3) One glucose molecule yields 25 ATP molecules during electron transport chain.
 - (4) Glycerol molecules are contributing to aerobic respiration as G_3P in glycolysis.
 - (5) All ATP molecules produced during aerobic respiration are synthesized within mitochondria.
8. (A) Origin and radiation of reptiles.
(B) Radiation of present day mammals.
(C) Origin of flowering plants and differentiation.
- State the eras in which the above events happened respectively.
- (1) Mesozoic, Cenozoic, Paleozoic.
 - (2) Mesozoic, Paleozoic, Cenozoic.
 - (3) Paleozoic, Cenozoic, Mesozoic.
 - (4) Cenozoic, Paleozoic, Mesozoic.
 - (5) Paleozoic, Mesozoic, Cenozoic.

9. Which answer includes the respective order of protists bearing following characteristics?

- (A) Have contractile vacuoles but no food vacuoles.
- (B) Bears chloroplast.
- (C) Golden brown in colour.
- (D) Has a mega nucleus and a micro nucleus.

- (1) *Paramecium, Euglena, Gelidium, Amoeba.*
- (2) *Euglena, Euglena, Sargassum, Paramecium.*
- (3) *Amoeba, Gelidium, Diatoms, Euglena.*
- (4) *Euglena, Ulva, Diatoms, Paramecium.*
- (5) *Paramecium, Ulva, Sargassum, Paramecium.*

10. What is the phylum in which we can observe dorsal cerebral ganglion, ventral nerve cord, circumenteric connectives?

- (1) Nematoda
- (2) Mollusca
- (3) Annelida
- (4) Arthropoda
- (5) Platyhelminthes

11. Not an important feature of seed plants.

- (1) Endosperm supplies food for the embryo.
- (2) Ovule consists of megasporangium, megaspore and integument.
- (3) Every microsporangium contains one functional microspore.
- (4) Megasporangium is remained inside sporophyte.
- (5) Gametophyte is found inside the sporangium of sporophyte.

12. Select the correct statement.

- (1) The pericycle is located inner to the endodermis and its made by a single layer in plant roots.
- (2) There can be collenchyma cells immediately below the epidermis of dicot plants.
- (3) The periderm of a monocot plant has no meristematic function.
- (4) Vascular cambium is a ring of initials and elongated initials are oriented with their axis perpendicular to the axis of the root.
- (5) Lenticels are vertical slits in the periderm of a secondary grown tree for gas exchange.

13. Select the correct statement.

- (1) Everything external to the plasma membrane of living cells and interior of dead cells such as vessel elements, tracheids, sieve tube elements belong to the apoplastic route.
- (2) The Casparian strip located in endodermal cells is suberized and semipermeable for water and minerals.
- (3) When soil solution enters into plant root through plasma membrane of root hairs, it travels to the vascular cylinder via plasmodesmata.
- (4) Least resistance for transport is in apoplastic route.
- (5) Both osmosis and active transport involve in transport of solutes from symplast to apoplast.

14. Choose the correct statement out of following.

- (1) Companion cells in gymnosperms aids in phloem loading.
- (2) Mitochondria are not available in sieve tube elements.
- (3) Sugars enter into sieve tube elements from mesophyll cells via apoplast route.
- (4) Only new secondary phloem involves in phloem translocation.
- (5) Vessel elements of Xylem tissue are longer than tracheids.

15. What is the incorrect statement about life cycles of terrestrial plants?

- (1) *Cycas* has a haploid endosperm.
- (2) Haploid spores are found in the capsule of sporophyte of *Pogonatum*.
- (3) Female gametophyte of *Selaginella* is covered by the wall of megaspore.
- (4) Generative nucleus of pollen grain divides by mitosis to produce two sperm nuclei in phylum anthophyta.
- (5) Mature male gametophyte of *Selaginella* partially depends on stored food.

16. Choose the incorrect statement about plant responses to internal and external signals.

- (1) The interval in a 24-hour period in which the plant gets exposed to light is called photoperiod.
- (2) Red light stimulates seed germination while blue light slows down the hypocotyl elongation.
- (3) Action spectrum reveals that red and blue lights are the most important colours in regulating plants photomorphogenesis.
- (4) Root display positive gravitropism while shoot display negative gravitropism.
- (5) Statoliths of vascular plants are specialized plastids and they are located in every cell of the root cap.

17. What is wrong about responses shown by plants to mechanical stimuli?

- (1) Trees grow in windy environments have shorter and stockier trunks than same species grown in normal environments.
- (2) The changes in plants due to mechanical disturbances is called thigmomorphogenesis.
- (3) Touching results in sudden turgor loss in cells of a specialized motor organ called pulvini in some plants.
- (4) *Mimosa pudica* plant shows thigmonasty.
- (5) The directional growth of a tendril towards a support is called thigmomorphogenesis.

18. What is the wrongly matched answer about plant growth substances and their functions?

- (1) Auxin – Stimulate pollen development.
- (2) Gibberellin – Stimulate stem elongation.
- (3) Cytokinin – Promote movement of nutrients into sink tissues.
- (4) Abscisic acid – Promotes seed dormancy.
- (5) Ethylene – Promotes root and root hair formation.

19. Identify the true statement about human digestive system.

- (1) Mucus in saliva helps in taste reception.
- (2) The enzymes trypsin and chymotrypsin are secreted by the wall of intestine.
- (3) Bile is secreted by pancreas.
- (4) Conversion of DNA and RNA to nucleotides is stimulated by nucleotidases.
- (5) Hepatic macrophages are found in the lining of sinusoids.

20. What is the deficiency symptom of ascorbic acid?

- (1) Rickets.
- (2) Beri Beri disease.
- (3) Pellagra.
- (4) Scurvy.
- (5) Paralysis.

21. Select the correct statement about human blood circulatory system.

- (1) Mature red blood cells have nuclei.
- (2) Protein concentration in blood plasma is lower than the interstitial fluid.
- (3) Respiratory pigment called haemocyanin can be seen in haemolymph of arthropods.
- (4) The diastolic pressure of a healthy adult is 120mmHg.
- (5) The myocardium of heart wall encloses the chambers and valves of the heart.

22. Choose the incorrect statement about cellular components in blood.

- (1) Adrenal glands secrete the erythropoietin hormone which stimulates red blood cell production.
- (2) Life span of a red blood cell is about 120 days.
- (3) There are 4-6 millions of red blood cells in one microliter of blood.
- (4) White blood cells increase immune responses against foreign substances.
- (5) Platelets are derived from bone marrow cells and they don't have nuclei.

23. Select the correct response about human lymphatic system.

- (1) The lymphatic system is closely connected with the blood circulatory system only functionally.
- (2) The composition of lymph is greater than that of interstitial fluid.
- (3) The lymph is drained into veins at the lumbar area via two large ducts.
- (4) Showing immune responses is a function of lymphatic system.
- (5) Lymph nodes are composed of red blood cells and connective tissues.

24. Find the false statement about excretory organs of animals.

- (1) Kidneys are the major excretory and osmoregulatory organs of all vertebrates.
- (2) Cnidarians remove their excretory materials by diffusion.
- (3) Green glands are two small glands located anteriorly in the head and ventral to the oesophagus.
- (4) Nephridia are multicellular tubular structures.
- (5) Malpighian tubules are tubules immersed in haemolymph and opens into the digestive tract.

25. When stimulating parasympathetic nervous system,

- (1) Nerve impulses are transmitted only via spinal nerves.
- (2) Heart rate is decreased by noradrenaline hormone produced by adrenal medulla.
- (3) Controls ciliary muscle contraction and eye accommodation.
- (4) Inhibits sexual behavior and related activities.
- (5) Controls involuntary and some voluntary body activities.

26. Choose the pair of diseases which are not related with genetic or inherited diseases,

- (1) Diabetes mellitus I, Alzheimer's disease
- (2) Diabetes mellitus II, Parkinson disease
- (3) Parkinson disease, Osteo-arthritis
- (4) Hyperthyroidism, Osteoporosis
- (5) Diabetes mellitus I, Depression

27. Select the correct statement.

- (1) Heat receptors in the skin are specialized nerve cells.
- (2) Papillae are found within taste buds which are small projections of the tongue.
- (3) Olfactory receptors are epithelial cells located within the epithelium of upper portion of nasal cavity.
- (4) Semicircular canals detect the position respective to gravity.
- (5) Sound vibrations are detected by specialized hair cells in organ of corti.

28. Choose the falsely matched answer about embryonic membrane and it's function.

- (1) Chorion - Produces hCG, an important hormone in pregnancy.
- (2) Amnion - The fluid filled cavity serving as a shock absorber and prevent desiccation of the fetus.
- (3) Yolk sac - Serves as an early site for blood formation.
- (4) Allantois - Associated with the development of the urinary bladder.
- (5) Yolk sac - Source of primordial germ cells that migrate to the developing gonads.

29. Select the most un-matching statement made about female reproductive system.

- (1) A whole sperm or a spermatid nucleus is injected directly into the cytoplasm of an oocyte in ICSI method.
- (2) Depo-Provera injection thicken cervical mucus and prevents sperm entry and blocks ovulation.
- (3) About 50000-100000 sperms are required per oocyte for fertilization in IVF method.
- (4) Non- surgical abortion is possible within 7 weeks after conception.
- (5) Itchy painful sores around genital area is a symptom of genital herpes.

30. Select the correct answer about the human skeletal system.

- (1) The 2 clavicles as well as the first three pairs of ribs are articulated with the manubrium.
- (2) Anteriorly 2-7 ribs are true ribs and 8-12 ribs indirectly connect to the sternum.
- (3) The tubercle of a rib articulates with the body of a thoracic vertebra while head articulates with the transverse process.
- (4) Scapula is an anteriorly concave, triangular, flat bone and a process is available in its surface.
- (5) Excessive use of affected joints, female gender and increasing age are risk factors for Osteoarthritis.

31. What is the correct statement about bones?

- (1) Vomer and sphenoid bones are facial bones.
- (2) Fontanelles are soft, membranous regions located between all cranial bones.
- (3) Sinuses are found in three bones of the cranium.
- (4) Primary curves are inferiorly convex and secondary curves are anteriorly concave.
- (5) Sacrum is a large bone of five rudimentary bones and it's posteriorly concave.

32. Generally detached earlobes are dominant to attached earlobes in humans. What is the percentage of heterozygous dominants in a population where 1% bears attached earlobes?

- (1) 64%
- (2) 81%
- (3) 48%
- (4) 80%
- (5) 72%

33. Select the correct answer.

- (1) A person can get a straight finger due to the absence of dominant allele.
- (2) Though garden pea plant is used in genetic experiments, the interactions between those plants cannot be completely controlled.
- (3) When finding an unknown genotype, it's not necessary to cross that organism with an organism having homozygous recessive condition for that character.
- (4) Epigenetic inheritance may get reversed by various external stimuli from the environment.
- (5) Pleiotropic alleles cause haemophilia and cystic fibrosis.

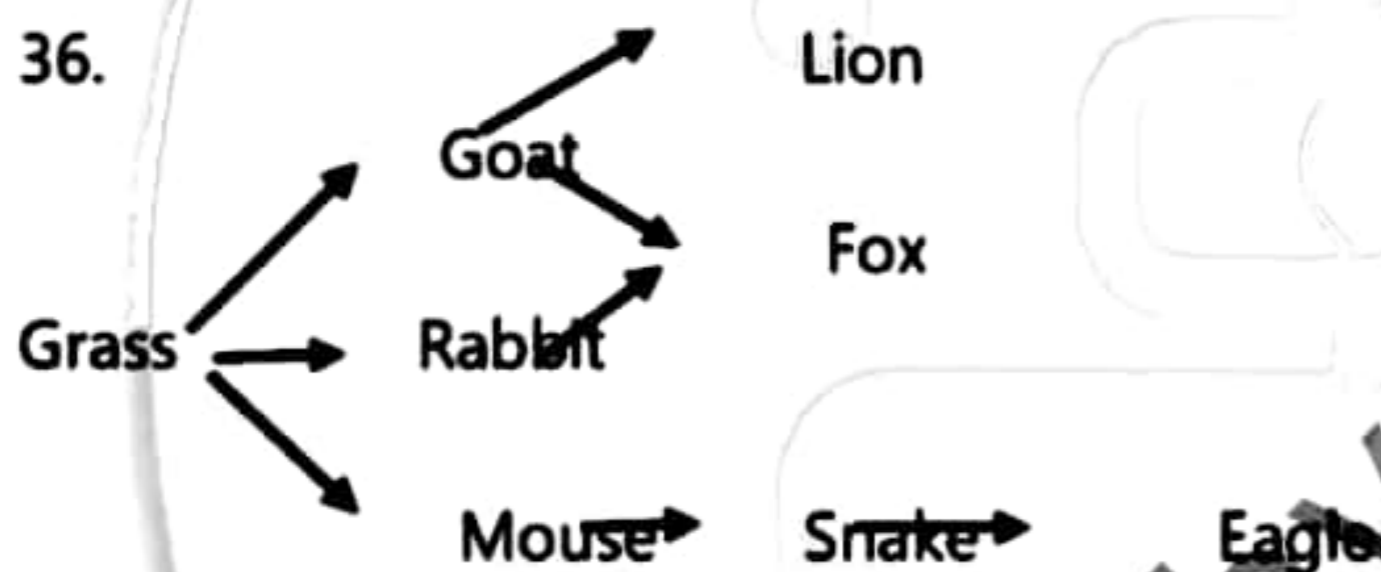
34. Choose the incorrect statement about genetic code.

- (1) Genetic code is a universal code.
- (2) Always read from left to right as a convention.
- (3) Only 61 codons provide codes for 20 amino acids.
- (4) The codon AUG codes for methionine and provides signals for m-RNA transcription.
- (5) UAA, UAG and UGA are termination codons.

35. What is the false statement about the applications of gene technology?

- (1) The enzyme reverse transcriptase is used to maintain cDNA libraries.
- (2) Most common markers are antibiotic resistant.
- (3) The double stranded nature of DNA on agarose jell is shown by ethidium bromide pigment.
- (4) In disarming T-DNA, tumor inducing genes as well as virulent genes are removed.
- (5) Yeast vectors should contain sequence of centromere and autonomously replicating sequences.

36.



Select the correct statement about above food web,

- (1) Each food chain found here has four trophic levels.
- (2) Only Fox and Snake can be considered as secondary consumers.
- (3) There is an equal threat for the existence of both foxes and lions if the goat population decreases.
- (4) Lion and Eagle does not belong to the same trophic level.
- (5) Increase in Fox population may cause the increase of population of the primary producer.

37. Choose the incorrect statement about biomes of the world.

- (1) Savannas are characterized by a landscape that support scattered trees in a tall grass cover.
- (2) The heights of grasses vary from few centimeters to two meters in tall grass prairie.
- (3) Stratification can be seen in temperate broad leaf forests.
- (4) A dry season of 9-10 months is prominent in tropical dry forests.
- (5) Tundra biome is heavily used for extraction of minerals and oils.

38. Choose the matching relationship out of following.

- (1) Dry zone - Damana, Thalawa, Savanna, Dry pathana
- (2) Vulnerable species- Dusky-Striped Jungle squirrel, Butter cup, Vesak Orchid
- (3) Tropical thorn Scrubs-Gini-andara, Ranawara, Heerassa
- (4) Greenhouse gases- CO₂, NO₂, O₂
- (5) Man-made Wetlands-Tanks, Reservoirs, Rivers

39. What is the wrong statement about the viruses, prions and viroids?

- (1) Bacteriophages can exhibit more than one form of symmetry.
- (2) Viroids are plant infecting and consist of only short piece of naked RNA.
- (3) CJD is a disease caused by prions to humans.
- (4) Covid 19 virus does not bear any type of protein synthesis mechanism or enzymes.
- (5) Although prions lack DNA, they can replicate with the help of host's genes.

40. What is the correct statement about the use of micro-organisms for domestic water and waste water?

- (1) Gram negative anaerobic coliform bacteria are used to check the quality of drinking water.
- (2) In activated sludge, micro-organisms grow on the filter bed and oxidize organic water.
- (3) No biological activity is used in primary waste water treatment.
- (4) In secondary treatment 75-85% of organic materials are oxidized.
- (5) Cleaning drinking water is the process of removing disease causing agents in water by sterilization.

41. How class Osteichthyes differ from class Chondrichthyes?

- A) Bony skeleton.
- B) Swim bladder to control buoyancy.
- C) Some are Ovoviviparous.
- D) Only external fertilization.
- E) Aquatic.

42. Which elements cause chlorosis between veins of young leaves?

- A) Mo
- B) Fe
- C) S
- D) Mg
- E) Ni

43. Incorrect statement/statements about cartilage is/are,

- A) Support places such as trachea, intervertebral discs.
- B) Chondrocytes secrete chondroitin sulphate and collagen fibers.
- C) Rubber like inflexible protein, carbohydrate complex
- D) Matrix of the tissue is made of chondrocytes.
- E) Collagen fibers and chondrocytes are embedded in the matrix.

44. Which are secreted to the filtrate from interstitial fluid and peritubular capillaries?

- A) H^+ and NH_3
- B) Creatine
- C) Excess Na^+
- D) Drugs-Penicillin
- E) HCO_3^- ions

45. What are the correct statement/s about hormones?

- A) Diarrhea conditions can occur due to over exposure of body tissues to thyroxine.
- B) A secretion of a gland located directly behind the sternum, in between the lungs in the upper part of the chest contribute to the development and maturation.
- C) Cortisol is a mineralocorticoid and induces long term stress responses.
- D) Calcitonin acts on bones and release Ca^{2+} to blood by destroying bones.
- E) Thyroxine and Melatonin hormones act related to reproductive system.

46. What are the correct statements about mechanism of skeletal muscle contraction?

- A) Thin filaments are displayed as thick lines in sarcomeres and thick filaments are fixed to the H line.
- B) At active stage of myofibrils thick and thin filaments are partially overlapped.
- C) Myosin heads can bind with ATP molecules only when they are at lower energy state.
- D) Myosin heads can bind with actin filaments if only the binding sites are exposed to Ca^{2+} ions.
- E) Skeletal muscle contraction is completely voluntary and controlled by the motor nervous system.

47. Select the correct statement/statements.

- A) For a mother having heterogenous "A" blood group and a father having "B" blood group, it is possible to get children of "A", "B", "AB", "O" blood groups.
- B) A baby having "AB" blood group can be born to a mother having "A" blood group and father having "O" blood group.
- C) "A" carbohydrate is available in red blood cells of a person having "A" blood group.
- D) The percentage of getting a child with "A" blood group for a mother having heterogenous "B" group and a father having heterogenous "A" blood group is 25%.
- E) A mother having "A" blood group and a father having "AB" blood group, cannot have a child having "B" blood group.

48. Choose the correct statement /statements out of following.

- A) An advantage of using STR markers in DNA fingerprinting is that they are rare in genome.
- B) An enzyme activator is added to the PCR mixture.
- C) Typically, there are 40-45 cycles in a PCR cycle.
- D) The cotton modified to resist glufosinate is BXN cotton.
- E) VIII factor is used to treat thalassemia patients.

49. Identify the correct statement/statements.

- A) Wetlands are defined as areas of marsh, fen, peatland, villu according to the RAMSAR convention.
- B) *Lingula* found in Tambalagamuwa bay in Trincomalee is an example for exotic species in Sri Lanka.
- C) Sand dunes can be observed around Trincomalee, Kalipitiya and Yala areas.
- D) Water Hyacinth was introduced to Sri Lanka 110 years ago as an ornamental plant.
- E) The pH value of normal rain water is about 5.8 as carbonic acid is formed by dissolving carbon dioxide.

50. What are true about a Phytoplasma?

- A) Grow in artificial media.
- B) Anaerobic or facultative anaerobic organism.
- C) Sometimes do reproduction within animal bodies.
- D) Doesn't bear locomotive structures like cilia, flagella.
- E) Can be seen within phloem as well as xylem.



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Gampaha Medical Students' Association



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General Certificate of (Adv. Level) Examination - 2021

විව විද්‍යාව II
Biology II

Biology Model Paper

පැය 03 ටි
Three Hours

Name :

Grade :

Instructions :

- * This question paper consists of 10 questions in 14 pages.
- * This question paper comprises Part A and Part B. The time allotted for both papers is three hours.

PART A – Structured Essay

- * 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

- * Answer four questions only.
- * At the end of the time allotted for this paper, before handing over tie the two parts together so that Part A is on the top of Part B.

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	

(01) (A) (i) Who is the first organism originated on earth?

.....

(ii) State 2 major elements available in 4% of a living organism's mass.

.....

(iii) Explain how expansion upon freezing help to protect lives of aquatic organisms during winter.

.....
.....
.....
.....

(iv) State a function of each protein given below.

(a) Actin/myosin -

(b) Collagen -

(v) State 3 differences observed in flagella of prokaryotes and eukaryotes.

Prokaryote	Eukaryote

(vi) (a) What are called tight junctions?

.....
.....

(b) Mention the function of it.

.....

(B) (i) State the phase of cell cycle in which following events happen.

- (a) Fragmentation of nuclear envelope -
- (b) Nucleoli disappears -
- (c) Cell elongates as the non kinetochore microtubules are lengthen -

(ii) Represent the variation of rate of an enzymatic reaction with temperature and mark the optimum temperature.



(iii) What is the reason for lowering the enzyme activity when optimum pH value is altered?

.....

(iv) Why is the rate of reaction of an enzyme increases when the substrate concentration is increased ?

.....

(v) Explain induced-fit mechanism.

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(vi) Feedback inhibition is essential for regulation of end products of metabolism.

Explain this using an example.

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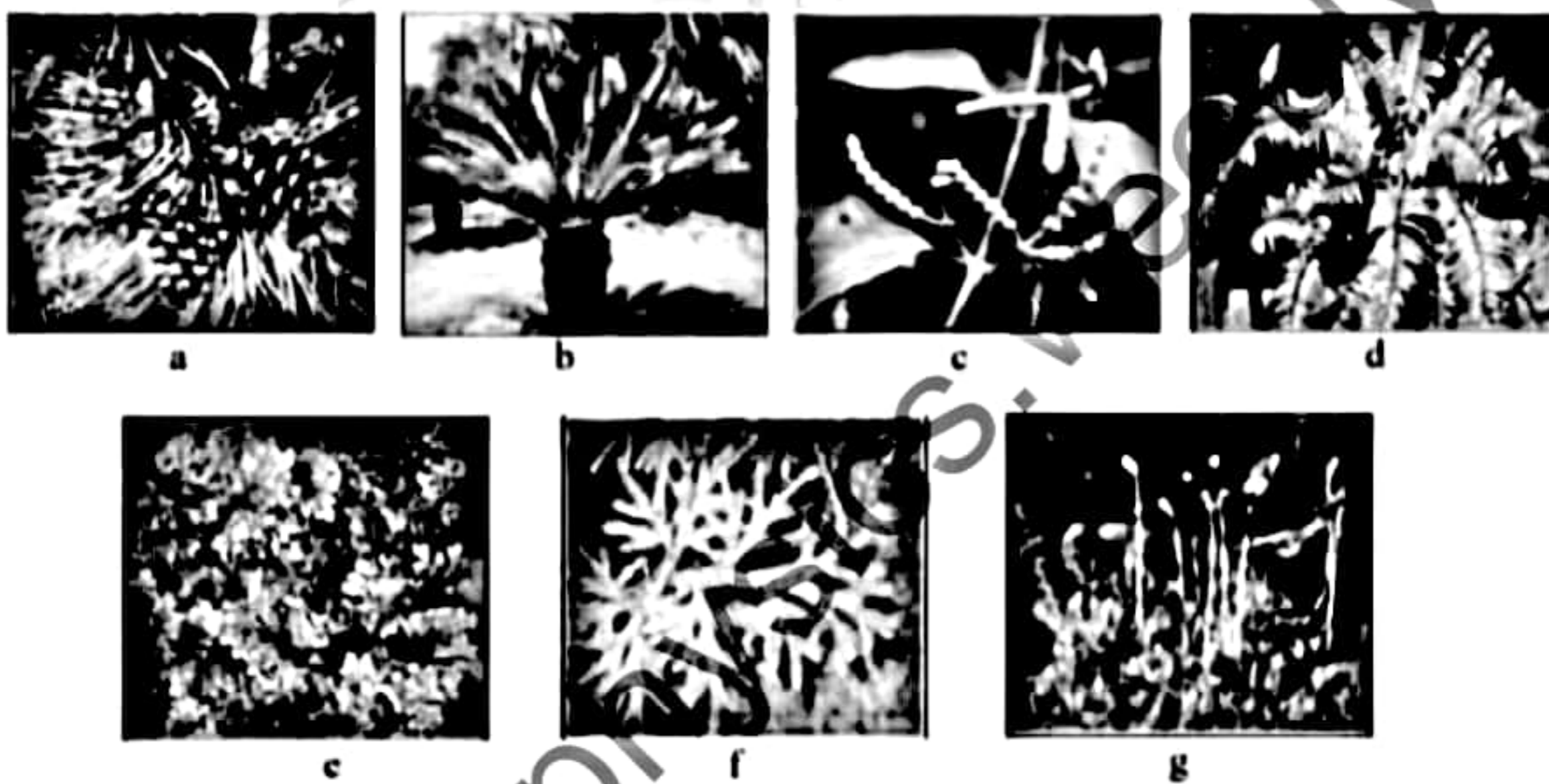
(C) (i) What are the favourable characteristics associated with reproduction described in theory of natural selection.

.....

(ii) Give 2 reasons for importance of having keratinized scales in the body of reptiles.

.....

(iii)



(a) Identify e and f

e - f -

(b) Mention the relevant letters corresponding to the images for the questions given below.

- (i) Gymnosperms having xylem vessels -
- (ii) Two types of spores are produced by separate cones -
- (iii) Produces leaf fronds -
- (iv) Both gametophyte and sporophyte are independent photosynthetic plants -
- (v) Produces seeds which has the appearance of a fruit of an angiosperm -

(02) (A) (i) State function of each type of tissue in the ground tissue system.

.....
.....
.....

(ii) (a) Write 2 common functions of xylem vessels and tracheids.

.....
.....

(b) What are the types of cells in phloem tissue of seedless vascular plants and gymnosperms.

.....
.....

(iii) (a) What is called sap wood?

.....
.....

(b) What are the plants where soft wood can be seen and what are the types of cells in it?

.....
.....

(iv) Write 2 special features of xylem vessels of spring wood.

.....
.....

(v) Write 2 differences between a typical monocot leaf and a typical dicot leaf.

monocot leaf	dicot leaf

(B) (i) What are the parts that belong to bark?

.....

(ii) Write 3 importances of transpiration

.....
.....
.....

(iii) Epidermal linings of same leaf of a *Rhoeo* plant were inserted to two sucrose solutions called A and B and left for 20 min. When observing from microscope it was detected that 50% of cells immersed in A solution were plasmolyzed. What is the pressure potential of cells of *Rhoeo* tissue immersed in B solution approximately?

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.....

(iv) What are called statoliths which help plants to detect gravity?

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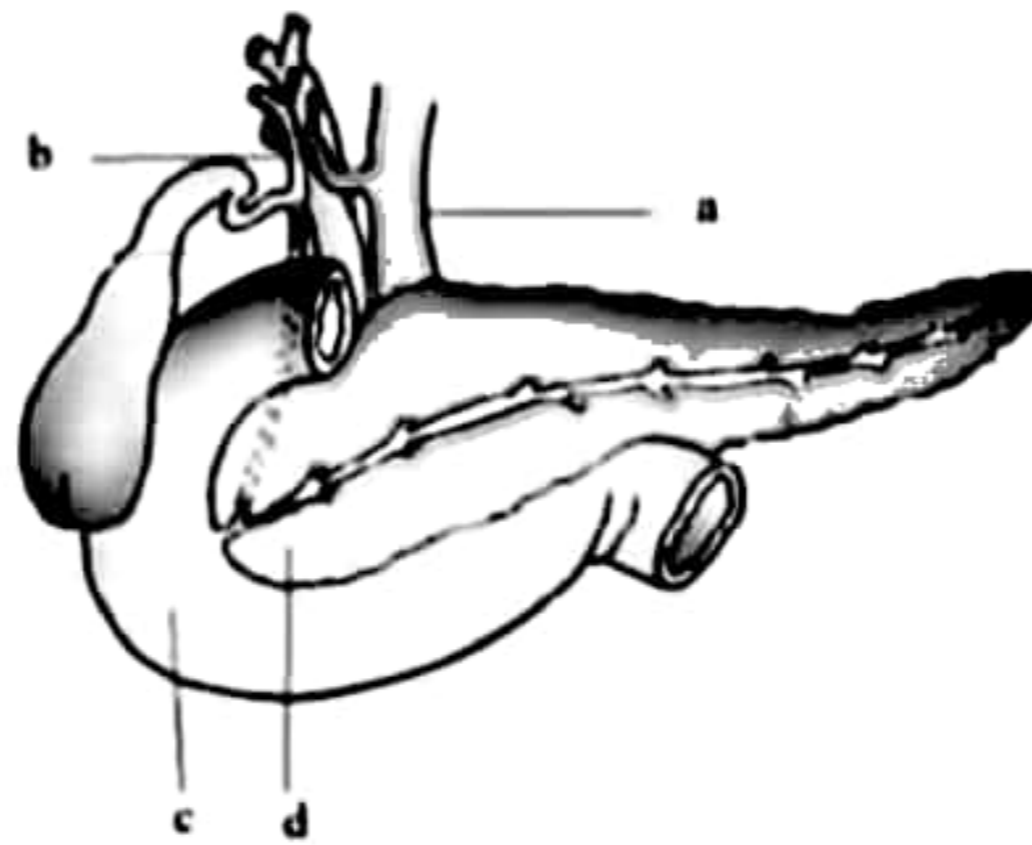
(v) (a) Which receptor regulates the plant responses to light mainly?

.....

(b) Write 2 functions of it.

1.
2.

(c)



(i) Name parts a to d.

a - c -

b - d -

(ii) Write an adaptation shown by stomach for followings.

(a) storing food -

(b) non specific defense -

(iii) How is the muscle arrangement in oesophagus?

.....
.....

(iv) Write 2 minerals which act as enzyme cofactors.

.....
.....

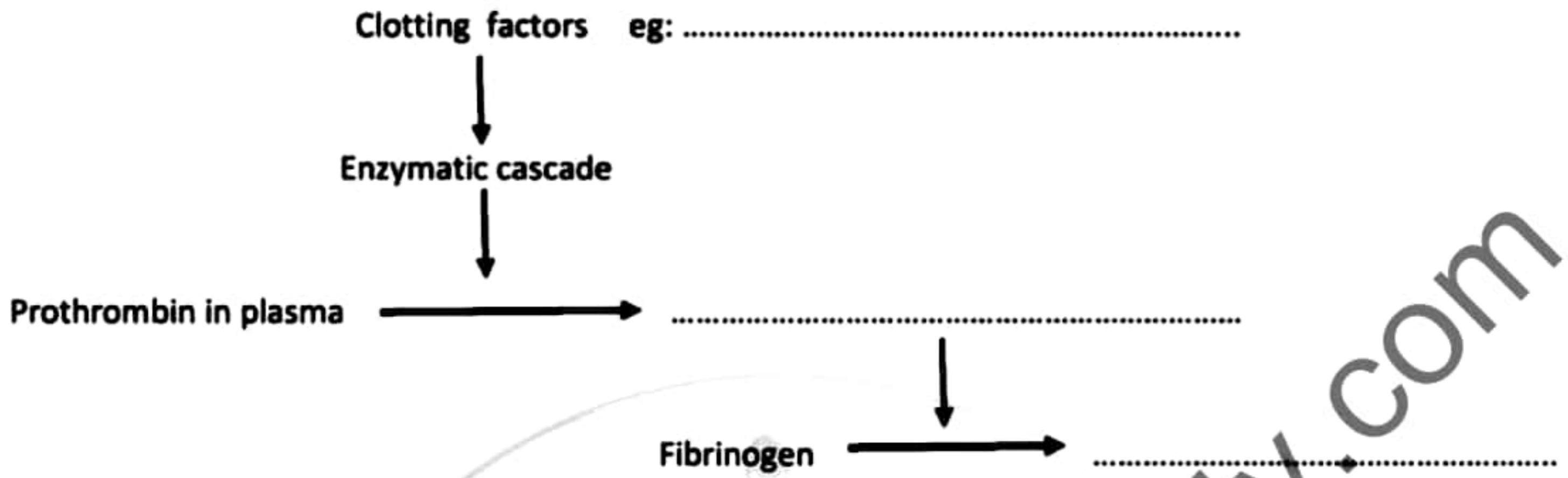
(v) (a) What is the type of circulatory system in phylum Annelida?

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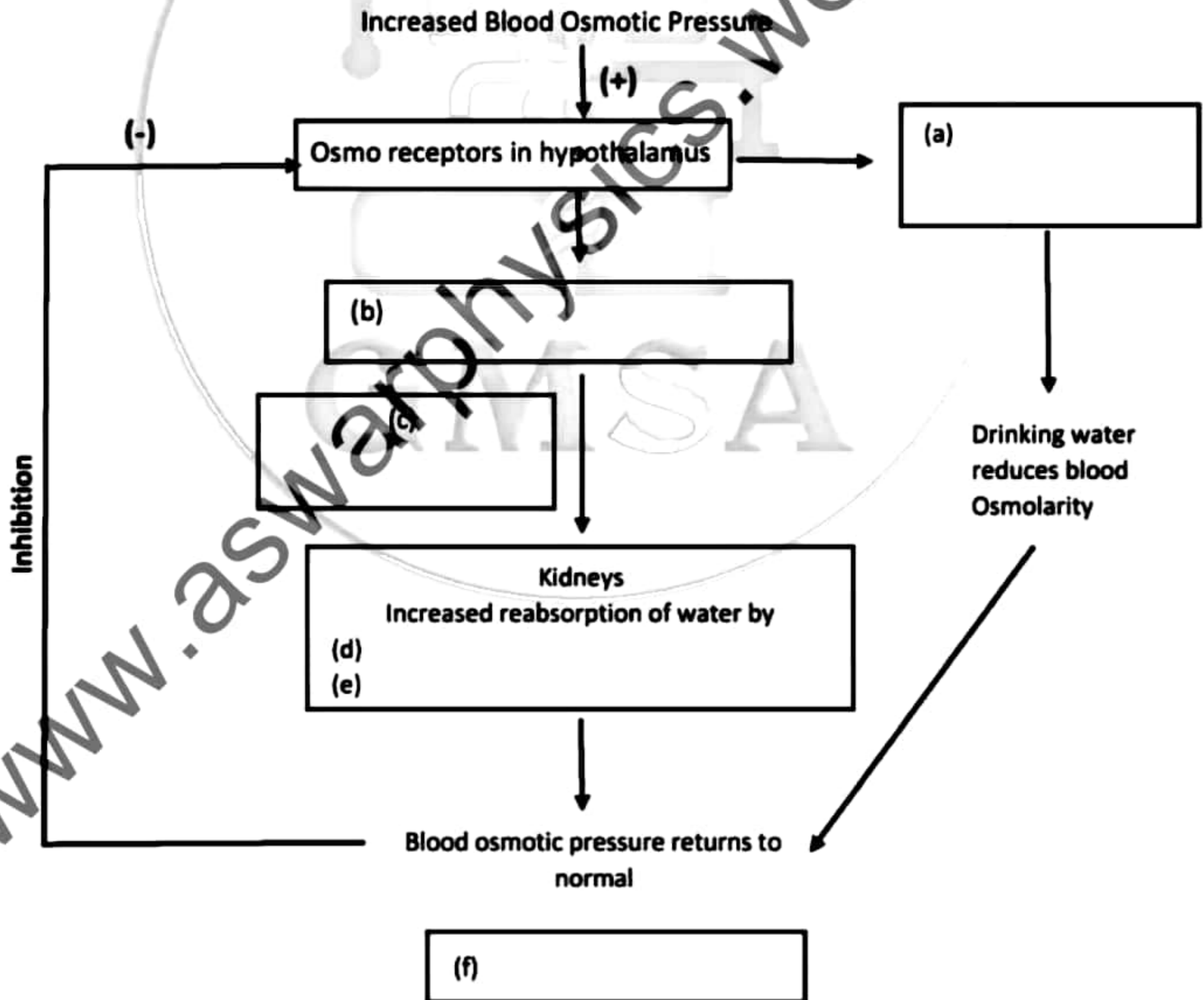
(b) State the composition of lymph nodes in lymph.

.....

(c) Fill in the blanks.



(03) (A) (i) Complete the following note about effect of hormones on action of kidneys.



(ii) Write the order of excretory products of animals in which decreases the poisonous nature.

.....

(iii) State the importance of secretion which is a major step of urine formation.

.....

.....

(iv) Write the 3 layers of meninges from innermost to outermost respectively.

1. 2. 3.

(v) Name the parts of human brain which does following functions.

(a) Coordinates body movements such as running, climbing -

(b) Receives and integrates audio and visual sensory information -

(c) Controls autonomic activities -

(B) (i) What are the two tubules located upper and lower to cochlear duct in order.

.....

.....

(ii) Explain how angular movements are detected by semi – circular canals in the ear.

.....

.....

.....

.....

(iii) What are the adaptations in the human skin against following factors ?

(a) Desiccation -

(b) Harmful UV rays -

(iv) State how posterior and anterior pituitary are connected with the hypothalamus.

.....

.....

(v) Mark the relevant hormone with the function using a (✓) mark.

- (a) Stimulate spermatogenesis →
- (b) Stimulate secretion of Testosterone →
- (c) Ovulation →

FSH	LH

(C) (i) Write 2 differences between external and internal fertilization.

External Fertilization	Internal Fertilization

(ii) State a function of each component of semen given below.

- (a) Fructose -
- (b) Coagulant enzymes -
- (c) Clear alkaline mucus -

(iii) Explain the quality of breast milk relative to cow's milk and other milk.

.....

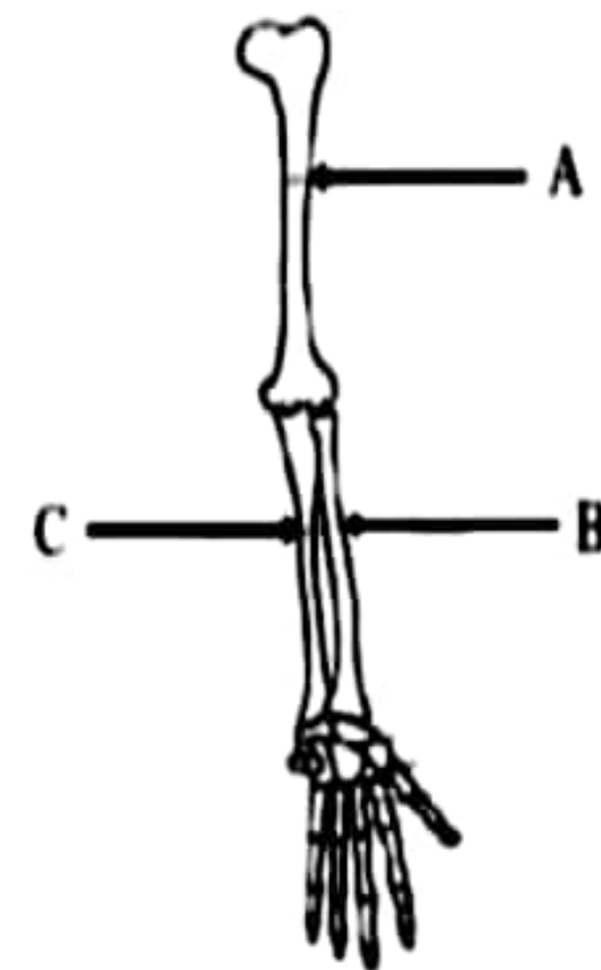
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(iv) (a) Name the parts A, B, C

- A -
- B -
- C -



(b) B and C are connected to each other with fibrous joint. State the importance of it.

.....
.....

(v) Explain the function of a pivot joint.

.....
.....

(04)

(A) At present Covid – 19 has become an epidemic which has entrapped the whole world. Spread of the disease is uncontrollable due to the speedy evolution and short average generation time.

(i) What do you mean by average generation time of viruses ?

.....

(ii) Beneficial mutations are a cause for evolution of a population. Define mutation and name the major types of mutations.

.....
.....
.....

(iii) Name chemical and physical mutagenic agents.

.....
.....

(iv) Describe how a non – sense mutation is formed during a point mutation.

.....
.....
.....

(v) Vaccines are used to control diseases caused by micro – organisms.

(a) Define vaccine.

.....
.....

(b) Name two types of vaccines which require booster doses.

.....

(c) Name a chemical sterilizing agent.

.....

(B) (i) What do you mean by architecture of chromosomes ?

.....

.....

(ii) State the two types of chromatin present in eukaryotic cells and give a function for each.

.....

.....

.....

(iii) What is the diameter of a chromosome which is in the metaphase of mitosis ?

.....

(iv) What is the main functional difference between an intron and an exon ?

.....

.....

.....

(v) State two human genetic disorders caused due to sex linked chromosomal mutations.

.....

.....

(C) (i) Complete the following table.

Biome	Annual Rainfall	Average Annual temperature
Tropical Rain Forests		
Tropical dry forests		

(ii) State two adaptations seen in desert plants to withstand scarcity of water.

.....

.....

(iii) What do you mean by a food web ?

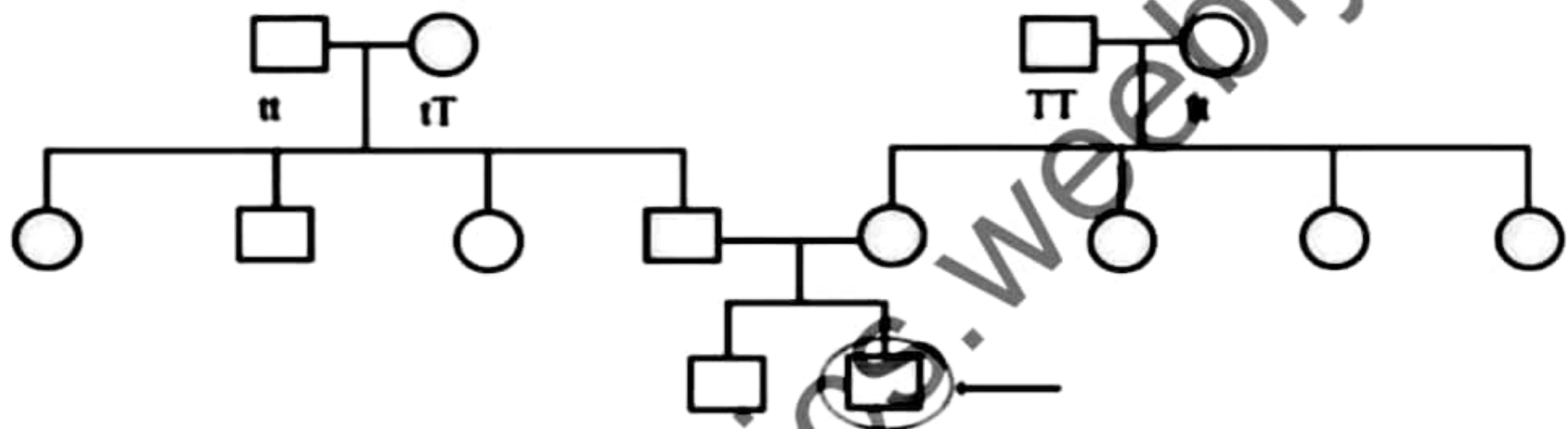
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(iv) Name two wetlands in Sri Lanka that are declared as Ramsar sites according to Ramsar convention.

.....

.....

(v) The inheritance pattern of the mendelian character of rolling of tongue over generations is shown below.



T – dominant allele
t – recessive allele

(a) State the possible genotype/s which the person mentioned with an arrow can carry.

.....

(b) Find the probability of having a child with the ability to roll the tongue in the 3rd generation using a punnett square.

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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය - 2021
General Certificate of (Adv. Level) Examination - 2021

Biology Model Paper

පීඨ විද්‍යාව II
Biology II

Part B – Essay

❖ Answer four questions only. (Each question carries 150 marks)

- (05) Explain the process of glucose synthesis using CO_2 and water within a C_3 plant.
- (06) Explain the responses of plants to biotic and abiotic stresses.
- (07) (a) Briefly describe immunity.
(b) Describe the external defenses of innate immunity.
- (08) (a) Explain the blood circulatory systems in the animal kingdom with examples.
(b) Explain hypertension and hypotension which are diseases associated with the blood circulatory system of humans.
- (09) (a) Explain the importance of DNA replication.
(b) Describe the importance of various enzymes in DNA replication.
- (10) Write short notes on the following.
(a) Effects of food spoilage on human health.
(b) Galls in plants.
(c) Desertification Or Tissue culture.



Marking Scheme



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



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Gampaha Medical Students' Association



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General Certificate of (Adv. Level) Examination - 2021

09- Biology

Marking Scheme

Part A – Structured essay

(01) (A) (i) Who is the first organism originated on earth?

Heterotrophic, anaerobic, prokaryotes

1 pt

(ii) State 2 major elements available in 4% of a living organism's mass.

Ca, P, K, S

(Any 2) 2 pts

(iii) Explain how expansion upon freezing help to protect lives of aquatic organisms during winter.

- When temperature lows down below 4°C a crystalline lattice called ice-cubes is formed.
- As density of it is less than water, ice floats on water bodies.
- Therefore aquatic animals in polar regions can survive during winter.

3 pts

(iv) State a function of each protein given below.

- (a) Actin/myosin - **Contraction of muscle fibers.**
(b) Collagen - **Provide strength and support**

2 pts

(v) State 3 differences observed in flagella of prokaryotes and eukaryotes.

Prokaryote	Eukaryote
• Simple	• Complex
• No microtubules	• microtubules bear <u>9+2</u> structure
• Extracellular	• Intercellular
• 20 nm diameter	• 200 nm diameter
• Not covered by plasma membrane	• covered by plasma membrane

(Any 3) 3 pts

(vi) (a) What are called tight junctions?

Structures which connect the plasma membranes of adjacent cells tightly bound by specific proteins forming continuous seals around the cells.

1 pt

(b) Mention the function of it.

Prevent leakages of extracellular fluids through intercellular space.

1 pt

(B) (i) State the phase of cell cycle in which following events happen.

(a) Fragmentation of nuclear envelope - **Pro meta phase**

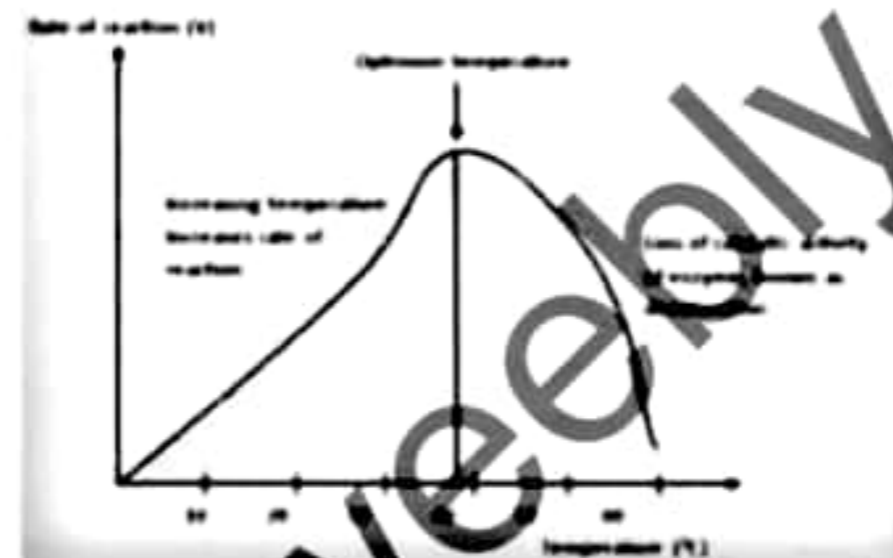
(b) Nucleoli disappears - **Prophase**

(c) Cell elongates as the non kinetochore
microtubules are lengthen - **Anaphase**

3 pts

(ii) Represent the variation of rate of an enzymatic reaction with temperature and mark the optimum temperature.

Axis - 1 x 2 ½
Shape - 1 x 2 ½
Temperature - 1 x 2 ½



(iii) What is the reason for lowering the enzyme activity when optimum pH value is altered? **Alteration of chemical bonds which form the enzyme-substrate complex.** 1 x 2 ½

(iv) Why the rate of reaction of an enzyme increases when the substrate concentration is increased ?

As the probability of colliding of substrate molecules and enzymes in correct orientation increases. 1 x 2 ½

(v) Explain induced-fit mechanism.

- **The shape of the active site of an enzyme is not always fully complementary to its substrate.**
- **As enzymes are not rigid structures.**
- **The interactions between substrate and active site may slightly change the shape of active site.**
- **So that the substrate and the active site become complementary to each other.** 4 x 2 ½

(vi) Feedback inhibition is essential for regulation of end products of metabolism.

Explain this using an example.

- **ATP acts as an allosteric activator and stimulates/induces production of ATP by catabolism.**
- **When ATP production exceeds the demand ATP binds as an inhibitor to the enzyme.**
- **and decrease the speed of catabolism.** 3 x 2 ½

(C) (i) What are the favourable characteristics associated with reproduction described in theory of natural selection.

- Fertilizing probability
- Number of offspring produced.

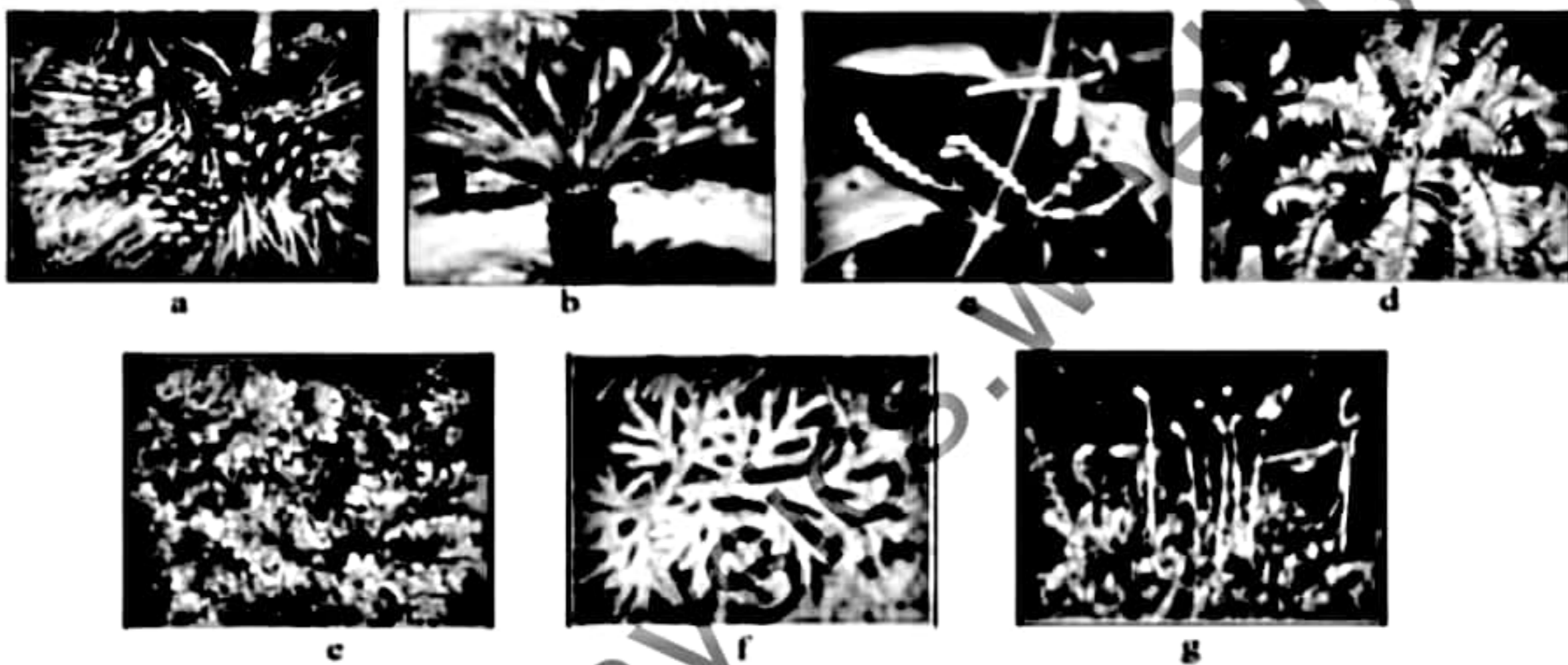
2 x 2 ½

(ii) Give 2 reasons for importance of having keratinized scales in the body of reptiles.

- Prevent from desiccation
- Resist abrasion

2 x 2 ½

(iii)



(a) Identify e and f

e - *Selaginella*

f - *Lycopodium*

2 pts

(b) Mention the relevant letters corresponding to the images for the questions given below.

- (I) Gymnosperms having xylem vessels
- (II) Two types of spores are produced by separate cones
- (III) Produces leaf fronds
- (IV) Both gametophyte and sporophyte are independent photosynthetic plants
- (V) Produces seeds which has the appearance of a fruit of an angiosperm

- c
- a
- b, d
- d
- c

6 pts

Total 40 x 2 ½ = 100 marks

(02) (A) (i) State function of each type of tissue in the ground tissue system.

- **Parenchyma** - Perform most of the metabolic functions of the plant/ storage/ ability to divide and differentiate under suitable conditions.
- **Collenchyma** - Give mechanical support to leaves and stems without restraining growth.
- **Sclerenchyma** - Provide support and strength to the plant

(Any 1) 1 pt x 3 = 3 pts

(ii) (a) Write 2 common functions of xylem vessels and tracheids.

- **Transport/ conduction of water and mineral ions**
- **Prevent collapsing by providing support for water transportation under a tension.**

2 pts

(b) What are the types of cells in phloem tissue of seedless vascular plants and gymnosperms.

Sieve cells, phloem fibers, phloem parenchyma

1 pt

(iii) (a) What is called sap wood?

The newest outer layers of secondary xylem, still transport xylem sap.

2 pts

(b) What are the plants where soft wood can be seen and what are the types of cells in it?

- **Gymnosperms**
- **Tracheids, xylem fibers, xylem parenchyma**

1 pt

3 pts

(iv) Write 2 special features of xylem vessels of spring wood.

- **Lumen of the xylem vessel is larger.**
- **Wall of vessel elements is thin.**

2 pts

(v) Write 2 differences between a typical monocot leaf and a typical dicot leaf.

monocot leaf	dicot leaf
• parallel venation	• Reticulate venation
• stomata in upper and lower surfaces	• stomata are mainly in lower epidermis
• mesophyll is not differentiated	• mesophyll is differentiated into spongy and palisade layers.
• chloroplasts are abundant in all mesophyll cells	• relatively high amount of chloroplast are in palisade mesophylls

(Any 2) 2 pts

(B) (i) What are the parts that belong to bark?

Secondary phloem and periderm.

1 pt

(ii) Write 3 importances of transpiration

- **Distribute minerals and water throughout the plant.**
- **Ascent of water in the xylem.**
- **Uptake of water and minerals by roots from soil solution.**

3 pts

(iii) Epidermal linings of same leaf of a *Rhoeo* plant were inserted to two sucrose solutions called A and B and left for 20 min. When observing from microscope it was detected that 50% of cells immersed in A solution were plasmolyzed. What is the pressure potential of cells of *Rhoeo* tissue immersed in B solution approximately?

Ψ_s of solution A = -1200 MPa

Ψ_s of solution B = -950 MPa

As 50% cells are plasmolyzed cells immersed in A solution are at incipient plasmolysis.

$\therefore \Psi_p = 0$

\therefore When A solution is at equilibrium, $\Psi = \Psi_s = -1200$ MPa

1 pt

As the cell of same plant, Ψ_s of B cell is also -1200 MPa

1 pt

\therefore for B cell,

$$\Psi = \Psi_s + \Psi_p$$

$$-950 \text{ MPa} = -1200 \text{ MPa} + \Psi_p$$

$$\Psi_p = +250 \text{ MPa}$$

1 pt

(iv) What are called statoliths which help plants to detect gravity?

Specialized plastids containing dense starch grains in vascular plants

1 pt

(v) (a) Which receptor regulates the plant responses to light mainly?

Phytochrome photo receptor

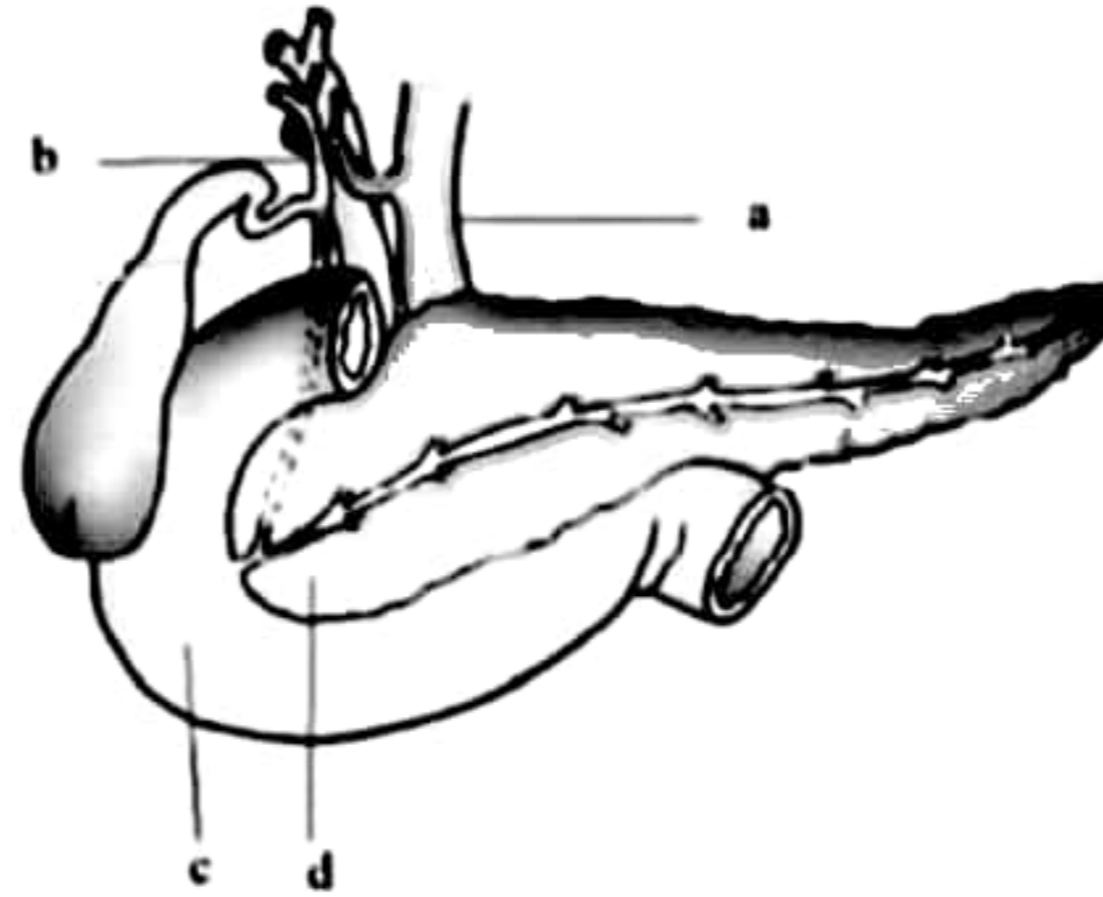
1 pt

(b) Write 2 functions of it.

1. **Seed germination**
2. **Shade avoidance**

2 pts

(C)



(i) Name parts a to d.

a – aorta

c - Duodenum

b - Hepatic duct

d - Head of pancreas/ pancreas

4 pts

(ii) Write an adaptation shown by stomach for followings.

(a) storing food - Highly convoluted, highly extensible

2 pts

(b) non specific defense - production of HCl by secreting H⁺ and Cl⁻ separately

(iii) How is the muscle arrangement in oesophagus?

Uppermost part is made of skeletal muscles while other part is made of smooth muscles.

(iv) Write 2 minerals which act as enzyme cofactors.

1 pt

• Mg

• Fe

2 pts

(v) (a) What is the type of circulatory system in phylum Annelida?

closed circulatory system

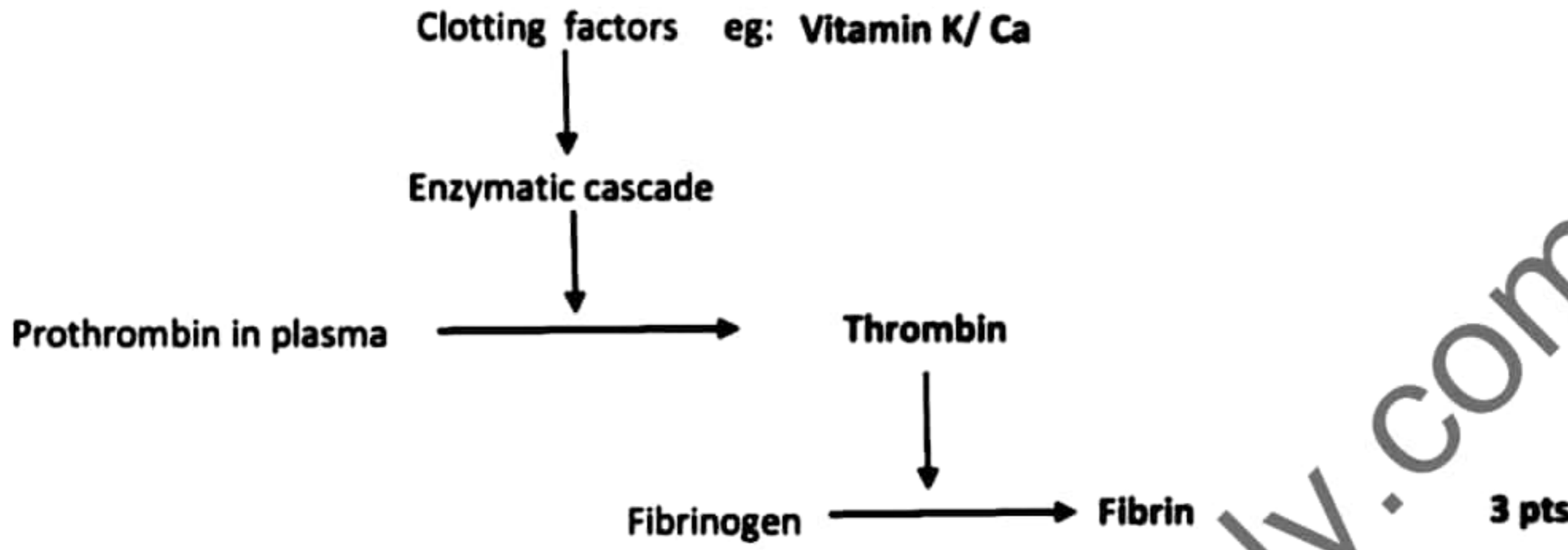
(b) State the composition of lymph nodes in lymph.

1 pt

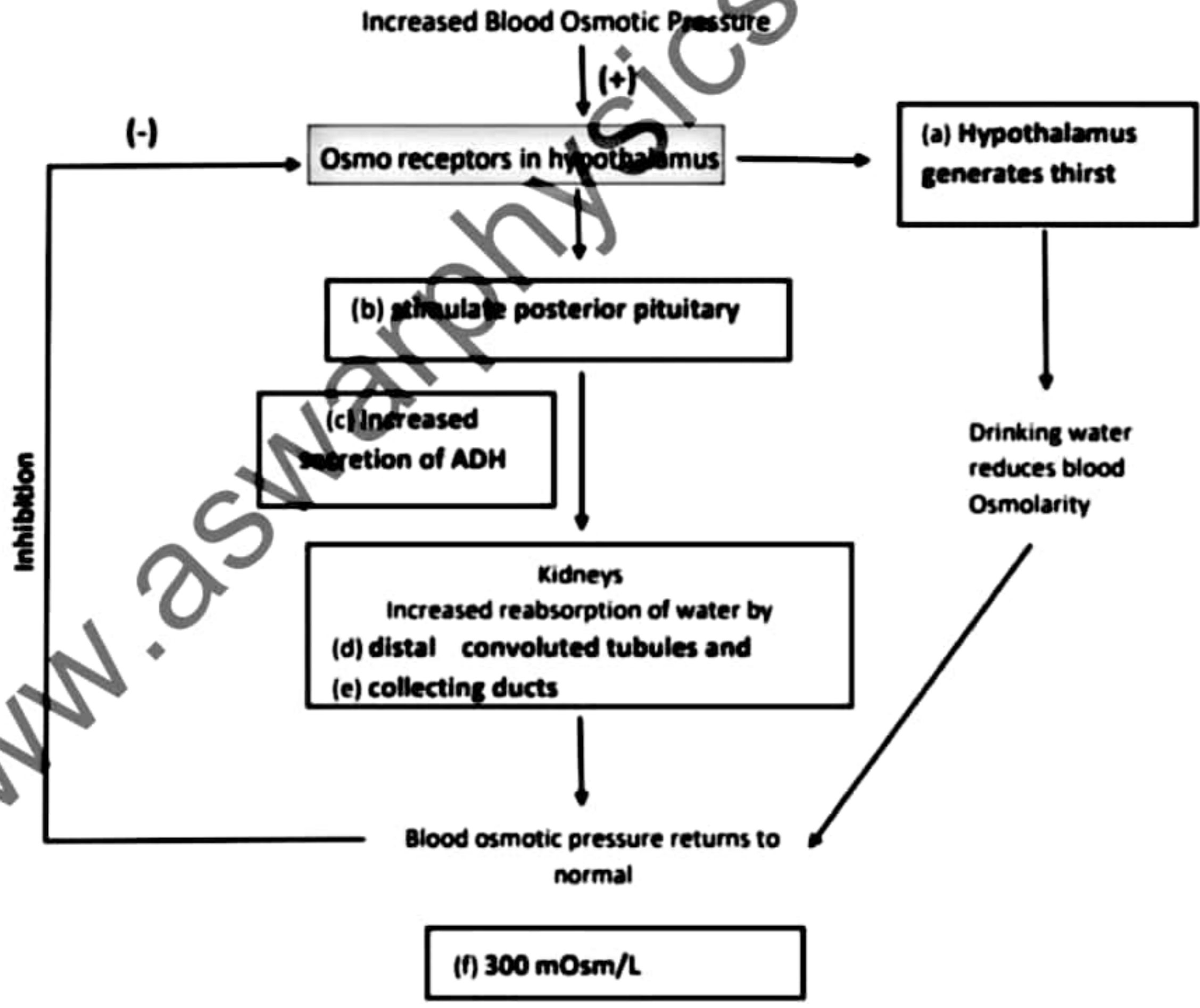
connective tissue, white blood cells

1 pt

(c) Fill in the blanks.



(03) (A) (i) Complete the following note about effect of hormones on action of kidneys.



(ii) Write the order of excretory products of animals in which decreases the poisonous nature.

Uric acid , Urea , Ammonia

1 pt

(iii) State the importance of secretion which is a major step of urine formation.

Because substances may not be entirely filtered due to the short time they remain in the glomerulus.

1 pt

(iv) Write the 3 layers of meninges from innermost to outermost respectively.

1. pia mater 2. arachnoid mater 3. dura mater

1 pt

(v) Name the parts of human brain which does following functions.

- (a) Coordinates body movements such as running, climbing - **Medulla Oblongata, Pons varoli**
- (b) Receives and integrates audio and visual sensory information - **Mid brain**
- (c) Controls autonomic activities - **Medulla Oblongata**

4 pts

(B) (i) What are the two tubules located upper and lower to cochlear duct in order.

- **Upper – Vestibular canal**
- **Lower – Tympanic canal**

2 pts

(ii) Explain how angular movements are detected by semi – circular canals in the ear.

- **Within each canal hair cells form a cluster with the hairs projecting into a gelatinous cap.**
- **Changes in the position of the head causes movements in the perilymph and endolymph.**
- **As a result hair cells are stimulated and resulting nerve impulses are transmitted to the brain.**

3 pts

(iii) What are the adaptations in the human skin against following factors ?

- (a) Desiccation - **keratinized epithelium impervious to water**
- (b) Harmful UV rays – **Melanin pigments**

2 pts

(iv) State how posterior and anterior pituitary are connected with the hypothalamus.

Posterior pituitary – Through Axons / nerve fibers
Anterior pituitary – Through portal blood vessels

2 pts

(v) Mark the relevant hormone with the function using a (✓) mark.

(a) Stimulate spermatogenesis →

(b) Stimulate secretion of Testosterone →

(c) Ovulation →

FSH	LH
✓	
	✓
	✓

3 pts

(C) (i) Write 2 differences between external and internal fertilization.

External Fertilization	Internal Fertilization
<ul style="list-style-type: none"> Always need moisture / external water 	<ul style="list-style-type: none"> Do not need external water and moist environment always
<ul style="list-style-type: none"> Release sperms to external environment 	<ul style="list-style-type: none"> Sperms are placed in female reproductive path

(ii) State a function of each component of semen given below.

2 pts

(a) Fructose

- provide energy to sperm

(b) Coagulant enzymes

- helps semen coagulates after ejaculation

(c) Clear alkaline mucus

- neutralize any acidic urine remaining in the urethra

Lubricates lining of urethra

3 pts

(iii) Explain the quality of breast milk relative to cow's milk and other milk.

- Compared to cow's milk, the fat, iron and the proteins in the breast milk are more readily metabolized.
- Lower sodium content of breast milk is more suited to the baby's needs.
- The baby is less likely to have allergic reactions to mother's milk.

3 pts

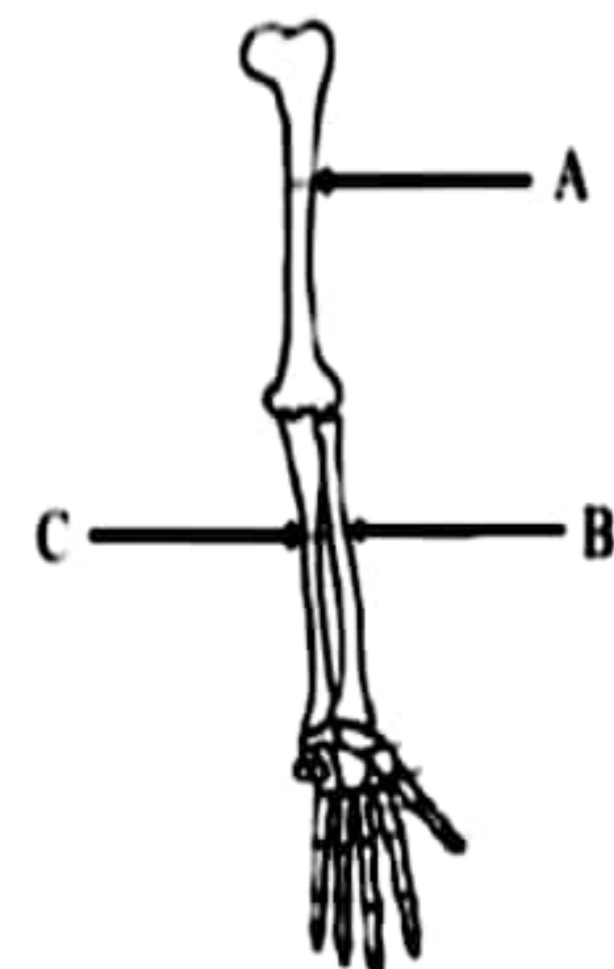
(iv) (a) Name the parts A, B, C

A - Humerus

B - Radius

C - Ulna

3 pts



(b) B and C are connected to each other with fibrous joint. State the importance of it.

Stabilize the association and maintain their relative position in spite of forces applied from the elbow or wrist. **2 pts**

(v) Explain the function of a pivot joint.

One bone fits into a hoop shaped ligament that holds it close to another bone and allows it to rotate in the ring formed by the ligament.

2 pts

(04) (A)

At present Covid – 19 has become an epidemic which has entrapped the whole world. Spread of the disease is uncontrollable due to the speedy evolution and short average generation time.

(i) What do you mean by average generation time of viruses ?

Time taken to double the population of a virus

1 pt

(ii) Beneficial mutations are a cause for evolution of a population. Define mutation and name the major types of mutations.

- **An alteration of the nucleotide sequence of the genome of an organism.**
- **Gene mutations**
- **Chromosomal mutations**

3 pts

(iii) Name chemical and physical mutagenic agents.

- **Physical- X rays , UV rays , γ rays , protons, neutrons, α rays, β rays**
- **Chemical – sodium azide, antimetabolic agent colchicine, ethyl methanosulphate**

Each 1 example- 2 pts

(iv) Describe how a non – sense mutation is formed during a point mutation.

In a point mutation a codon coding for an amino acid will be converted to a stop codon. (causing a premature termination of protein synthesis). Results in a shorter polypeptide than original.

3 pts

(v) Vaccines are used to control diseases caused by micro – organisms.

(a) Define vaccine.

A suspension of weakened pathogens or fractions of organisms that is used to induce immunity.

3 pts

(b) Name two types of vaccines which require booster doses.

Inactivated vaccines , Subunit vaccines

2 pts

(c) Name a chemical sterilizing agent.

Ethylene oxide / Chlorine dioxide

1 pt

(B) (i) What do you mean by architecture of chromosomes ?

the way the DNA molecules are arranged
in the nucleoid or nuclear region of the cytoplasm of the prokaryotic cells
or in the nucleus of eukaryotic cells.

3 pts

(ii) State the two types of chromatin present in eukaryotic cells and give a function for each.

- Euchromatin 1 pt
- Heterochromatin 1 pt
- Euchromatin:- active in transcription 1 pt
- Heterochromatin :- Gene regulation/ epigenetic inheritance/ chromosomal integrity (Any 1) 1 pt

(iii) What is the diameter of a chromosome which is in the metaphase of mitosis ?

$(700 \text{ nm} \times 2) = 1400 \text{ nm}$

1 pt

(iv) What is the main functional difference between an intron and an exon ?

sequences that code for polypeptides within a gene are exons.
Introns undergo transcription but do not translate into polypeptides.

2 pts

(v) State two human genetic disorders caused due to sex linked chromosomal mutations.

Turner syndrome
Klinefelter syndrome

2 pts

(C) (i) Complete the following table.

Biome	Annual Rainfall	Average Annual temperature
Tropical Rain Forests	2000 – 4000 mm	25°C – 29°C
Tropical dry forests	1500 – 2000 mm	33°C

4 pts

(ii) State two adaptations seen in desert plants to withstand scarcity of water.

Succulent plant body/ Deep roots in shrubs/ presence of spines/ presence of toxins in leaves/ most plant have C₄ pathway of photosynthesis/ reduced surface area of leaves/ ability to tolerate heat and desiccation.

(Any 2) 2 pts

(iii) What do you mean by a food web ?

An interconnected feeding relationship in an ecosystem.

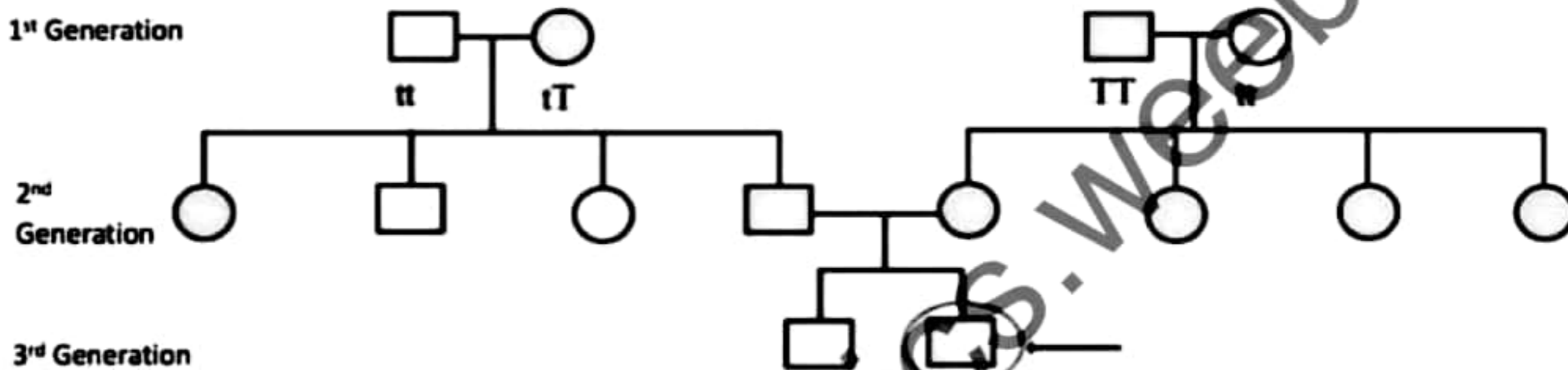
1 pt

(iv) Name two wetlands in Sri Lanka that are declared as Ramsar sites according to Ramsar convention.

Anawilundawa (sanctuary) / Bundala (national park) / Kumana (wetland) / Maduganga/ Vankalai (forest reserves)/ Wilpattu(forest reserves)

2 pts

(v) The inheritance pattern of the mendelian character of rolling of tongue over generations is shown below.



T – dominant allele
t – recessive allele

(a) State the possible genotype/s which the person mentioned with an arrow can carry.

TT, Tt

2 pts

(b) Find the probability of having a child with the ability to roll the tongue in the 3rd generation using a punnett square.

	♂	T	t
♀		TT	Tt
		Tt	tt

1 pt

3/4

1 pt

40 pts x 2.5 = 100 marks



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General Certificate of (Adv. Level) Examination - 2021

09- Biology

Marking Scheme - Paper II

Part B – Essay

(05) Explain the process of glucose synthesis using CO₂ and water within a C₄ plant.

1. CO₂ / Carbondioxide
2. is converted to bicarbonate / HCO₃⁻ ions
3. by carbonic anhydrase enzyme
4. within mesophyll cells of C₄ plants.
5. These (HCO₃⁻) bicarbonate ions are accepted by the CO₂ acceptor
6. (PEP) Phospho enol pyruvate
7. and immediately converted to a 4C compound
8. which is oxaloacetate.
9. Later oxaloacetate is converted to a more stable 4C compound
10. which is malate or Aspartate.
11. This malate / aspartate then diffuses into bundle sheath cells.
12. By the action of decarboxylating enzymes
13. CO₂ is released.
14. This CO₂ is refixed by Rubisco enzyme.
15. This exclusively operates bundle sheath cells of C₄ plants.
16. Calvin cycle occurs after this.
17. Which occurs in stroma of chloroplast.
18. This process consists of enzyme catalyzed reactions.
19. This is an anabolic reaction.
20. For net synthesis of one G₃P molecule
21. Calvin cycle must take place 3 times.
22. Calvin cycle is composed of 3 steps.
23. Carboxylation
24. The CO₂ acceptor is a 5C sugar.
25. It is Ribulose bisphosphate (RuBP)
26. Binding of CO₂ to RuBP is catalyzed by
27. Rubisco / RuBP carboxylase – oxygenase
28. The first product of RuBP carboxylation is a 6C molecule which is unstable.
29. It breaks down immediately into 2 molecules of 3-PGA (3 – phosphoglycerate)
30. This is the first stable product of photosynthesis.
31. Reduction phase
32. 1,3 – Bisphosphoglycerate
33. will be converted to glyceraldehyde 3 – phosphate (G₃P)
34. By step by step reductions.
35. Enzyme catalyzed reactions occur here.
36. NADPH
37. and ATP
38. which were synthesized during light reaction are utilized here.
39. G₃P will act as a precursor for carbohydrate synthesis.
40. Regeneration of RuBP
41. RuBP is regenerated by undergoing a series of complex reactions.
42. This process uses ATP energy generated in light reaction.

Any 38 x 4 = 152

Maximum marks = 150

(06) Explain the responses of plants to biotic and abiotic stresses.

1. Abiotic stresses are caused due to non-living factors
2. Drought stress
3. Cold stress
4. Salt stress

Drought stress

5. Plants may wilt when water loss by transpiration.
6. Exceeds water absorption.
7. Plants have control systems that enable them to cope with the drought / water deficit conditions.
8. Water deficit conditions (roots and leaves)
9. stimulate the synthesis and release of abscisic acid (ABA).
10. which acts on guard cell membrane, closing stomata to reduce transpiration.
11. Ex:- In grasses the leaves roll into a tube – like shape which reduces the surface area to reduce transpiration.
12. Some plants shed their leaves during seasonal drought.

Cold stress

13. When cell membrane cools below a critical temperature it loses its fluidity.
14. This is due to the lipids becoming locked into crystalline structure.
15. This blocks the transport across the membrane affects the functions of the cell.
16. Plants respond to cold stress by altering the lipid composition of their membrane.
17. In here the proportion of unsaturated fatty acids will be increased.
18. So that the membrane is kept more fluid at low temperatures.
19. Freezing is another cold stress.
20. Before freezing the solute-rich water in the cytosol,
21. water in the cell wall and intercellular spaces freezes.
22. The reduction of liquid water in the cell wall lowers the extracellular water potential.
23. Due to this water in cytosol leaves and can lead to cell death.
24. (In frost-tolerant plants) Before the onset of winter the cytoplasmic levels of specific solutes such as sugar increases.
25. This helps to reduce the loss of water from the cell preventing dehydration.

Salt stress

26. An excess of salts in soil lowers the water potential of soil.
27. This results in reduced water potential gradient from soil to root.
28. This leads to a reduction of water uptake by roots.
29. Too high salinity in soil is toxic to plants.
30. Many plants produce solutes that are well tolerated at high concentrations.
31. and respond to moderate soil salinity.
32. These organic compounds keep the water potential of the cell more negative than that of the soil solution. Ex:- Mangrove plants

33. Biotic stresses are caused by biotic factors.

34. This is how plants defend themselves against pest and pathogen attacks.

35. There are 2 categories of defense mechanisms.

36. Some compound and structures are already existing (preexisting structural) where as some are chemical defense mechanisms.

- Any 3
37, 38, 39
- Amount and quality of wax and cuticle that cover the epidermal cells
 - The structure of the epidermal cell walls and thickness.
 - The size, location, and shapes of stomata.
 - Toxic compounds, alkaloids, phenolics, terpenoids and lectin.
 - Thorns, pricks, trichomes

40. Induced structural and chemical defense mechanisms.

- Any 2
41, 42
- Morphological changes in the cell wall.
 - Formation of cork and abscission layers.
 - Phenolic compounds.
 - Toxic compounds.
 - Enzymes that can degrade fungal cell walls or damage insect organs.

Any 3 x 4 = 152

Maximum marks = 150

(07) (a) Briefly describe immunity.

1. The state of being resistance through defense mechanisms in the body,
2. against injury, invading pathogens and foreign substances
3. pathogens – some bacteria, virus and fungi
4. foreign substances – chemical components of pollen grains, incompatible blood cells, transplanted tissues
5. Immune responses are mainly divided into two types.
6. Innate immunity
7. Acquired immunity (adaptive immunity)

(b) Describe the external defenses of innate immunity.

8. External barriers discourage pathogens and foreign substances from penetrating the body.
9. So they are the first line of defense.
10. External defenses / barriers are found in the skin,
11. mucus membranes,
12. secretions of various organs.
13. They act as physical or chemical barriers.
14. Skin – it consists of many layers of closely packed keratinized cell layers.
15. provides a significant physical barrier to entrance of microbes.
16. Periodic shedding of epidermal cells,
17. helps to remove microbes from the skin surface.
18. Mucus membrane – lines the body cavities
19. providing a physical barrier.
 - lining the of the respiratory tract
 - lining the of the digestive tract
 - lining the of the urinary tract
 - lining the of the reproductive tract
20. Any 2
21. 20, 21
22. Mucus traps microbes and other particles.
23. In the respiratory tract, ciliated epithelial cells
24. sweep mucus and any entrapped material upward
25. coughing and sneezing speed up the mucus movement and its entrapped pathogens out of the body.
26. Secretions such as tears, saliva and mucus
27. protects the epithelial surface of the skin and mucus membranes.
28. Tears in eyes provide protection against irritants and microbes
29. provide continuous washing action in eyes
30. helps to dilute microbes and
31. Prevent settling on the surface of eyes and protect it.
32. Saliva reduces the colonization of microbes in the mouth.
33. Mucus secretions bathe various exposed epithelia provide a continual washing action
34. to dilute bacteria and fungi
35. and inhibit colonization.
36. Lysozyme enzyme present in tears, saliva, perspiration and mucus secretions
37. destroy cell walls of some bacteria.

38. Gastric juice provides an acidic environment in the stomach
39. and destroys many bacteria and bacterial toxins ingested with food.
40. Secretions of sweat and sebaceous glands of skin
41. give acidity which helps to prevent growth of bacteria.

Any 38 x 4 = 152

Maximum marks = 150

(08) (a) Explain the blood circulatory systems in the animal kingdom with examples.

1. There are two types of circulatory systems.
2. Open circulatory systems
3. Closed circulatory systems

Open

4. Haemolymph bathes the tissues and organs directly.
5. There is no distinction between the circulatory fluid and the interstitial fluid surrounding cells.
6. The heart pumps haemolymph through the circulatory vessels into the spaces which surround body tissues.
7. Chemical exchange occurs directly between haemolymph and body cells.
8. Backflow of the haemolymph takes place via the pores (ostia) with valves found in the heart during relaxation.
9. Ex:- Arthropoda and some molluscs.

Closed

10. Blood is restricted to vessels and kept apart from interstitial fluid.
11. Heart pumps blood into large vessels.
12. Large blood vessels branches into small vessels and penetrate into organs.
13. Chemical exchange occurs between blood and interstitial fluid
14. and interstitial fluid and body cells.
15. May contain one or more hearts.
16. Ex:- Vertebrates and invertebrates such as Annelids
17. Important for effective delivery of oxygen and nutrients to the cells of larger and more active animals.
18. Closed circulatory system consists of arteries, veins and capillaries.
19. Within each type of blood vessels blood flows only in one direction.
20. The blood vessels which carry blood from the heart to organs are called arteries.
21. When these arteries branch into smaller vessels they are called arterioles.
22. Material exchange between blood and interstitial fluid surrounding body cells.
23. Occur through diffusion and these places are called capillaries.
24. Capillaries converge to form venules.
25. Veins carry blood back to the heart.
26. Closed circulation consists of single circulation and double circulation.
27. During single circulation, in a complete circulation through the entire body, blood passes through the heart only once.
28. In animals with single circulation, the heart consists of two chambers as one atrium and one ventricle.
29. Ex:- Bony fishes
Cartilaginous fish such as rays and sharks.
30. During double circulation, in a complete circulation through the entire body, blood passes through the heart twice.
31. Double circulatory system consists of separate pulmonary and systemic circuits.
32. Ex: Aves, Amphibia, Mammalia, Reptilia.

(b) Explain hypertension and hypotension which are diseases associated with the blood circulatory system of humans.

Hypertension

(33) Sustained elevated blood pressure above normal limits is called hypertension.

- Consequences of hypertension are;

Kidney damage
Adrenal gland disorders
Heart attack
Stroke
Damaged blood vessels

} Any 2
34, 35

- Risk factors for hypertension;

Obesity, Diabetes, mellitus, Family history,
smoking, sedentary lifestyle, high intake of salts,
high intake of alcohols, stress,
deposition of low density lipoproteins (LDL) on artery walls.

} Any 2
36, 37

Hypotension

38. Sustained reduction of blood pressure below normal limits is called hypotension.

39. This leads to inadequate blood supply to the brain.

40. Fainting or prolonged fainting

41. Prolonged fainting can cause death.

- Causes for hypotension are;

Shock, Dengue haemorrhage fever,
overbleeding, fasting, low nutrition,
standing up suddenly from sitting or lying position.

} Any 1
42

Any 38 x 4 = 152

Maximum marks = 150

(09) (a) Explain the importance of DNA replication.

1. The essential information for life is stored in DNA.
2. Therefore, the new cells produced must receive the DNA from the parent cell.
3. As a multicellular organism grows by addition of new cells,
4. each cell in the body of a diploid organism should contain the same genetic information which was in the zygote.
5. Damaged or dead cells are also replaced by new cells.
6. In a sexual reproduction the genetic information stored in DNA,
7. is provided to each daughter cell as an identical set of genetic information
8. by DNA replication and mitosis.
9. In sexually reproducing organisms meiosis occurs at some point of life cycle,
10. in order to maintain a constant number of chromosomes.
11. DNA replication occurs prior to meiosis.
12. DNA replication is a very accurate process, so that it makes identical copies.
13. Rare errors occur in DNA replication introducing mutations which results in variation.
14. Variations lead to evolution of organisms.
15. DNA replication is important in maintenance of the life of an individual organism,
16. and continuation of a species.

Marks = 16 x 3 = 48

(b) Describe the importance of various enzymes in DNA replication.

1. Helicase
 2. Topoisomerase
 3. Primase
 4. DNA polymerase
 5. DNA ligase
- are the main enzymes required.

Helicase

6. Unwinds the double helix.
7. Break the hydrogen bonds between base pairs of two strands.
8. Separates the two strands of a DNA molecule.
9. Uses the energy of ATP.
10. Important for exposing the two strands.
11. which functions as template for new DNA synthesis.

Topoisomerase

12. The untwisting of the strands at one places causes further twisting and strain on other places.
13. These work ahead of the direction of DNA synthesis.
14. Introduce breaks on one or both strands of DNA.
15. Twist the molecule to relieve the strain
16. and then reseal the cut ends.

Primase

17. Type of RNA polymerase.
18. complementary ribonucleotides are added onto the template DNA.
19. small RNA fragment initiates the synthesis.
20. short RNA primer is added onto the template DNA.
21. DNA-RNA hybrid is formed.

DNA polymerase

22. There are several types.

One type:-

23. Add complementary deoxyribonucleotides to the 3' end.

24. and initiates the DNA polymerization.

25. New DNA strand is synthesized from 5' to 3' direction.

26. during polymerization

Another type:-

27. Identifies the DNA-RNA hybrid

28. removes ribonucleotides

29. and replaces those with deoxyribonucleotides

30. thereby replaces the RNA primer with DNA.

DNA ligase

31. Joins the newly synthesized adjacent fragments of DNA.

32. by forming phosphodiester bonds.

33. Seals the gaps of the newly synthesized DNA strand.

34. Forms a complete DNA strand.

Marks 34 x 3 = 102

Total marks = 102 + 48 = 150

(10) (a) Effects of food spoilage on human health.

1. Some micro-organisms produce various toxic substances in food.
2. Illness may result from consuming food spoiled by micro-organisms.
3. Micro-organisms grow in food
4. and multiply , increasing the number of microbial cells
5. and produce toxic chemical substances.
6. Ingestion of large numbers of microbial cells and their toxic chemicals by any individual through highly contaminated food, may develop diseases.
7. These diseases are of two types. They are,
8. Food borne infections.
9. Food intoxication
10. In food borne infections, the contaminating pathogenic micro-organisms enter the body through consumption of spoiled food and grow and multiply.
11. producing toxins which cause symptoms of the characteristic disease.
12. For example:-

<i>Salmonella typhi</i> - typhoid fever	}	Any 1
<i>Shigella</i> - dysentery		
<i>Vibrio cholerae</i> - cholera		
13. In food intoxication the spoiled food contains toxins produced due to microbial growth.
14. **Any individual** who consumes such contaminated food containing toxins will develop symptoms of the disease **within a short period of time.**
15. Illnesses due to food poisoning,
 - i. *Staphylococcus aureus* - food poisoning
 - ii. *Clostridium botulinum* - Botulism
 - iii. *Aspergillus flavus* - Aflatoxins
16. Viruses (entero viruses) also cause some food borne illnesses.

(b) Galls of plants

17. Occurs due to uncontrolled mitotic division of plant cell.
18. The plant cell division is controlled by maintaining a proper balance between plant growth regulators such as auxins and cytokinins.
19. When this balance is lost plant cells produce undifferentiated mass of cells.
20. Galls are the bumps and growths
21. that develop on different parts of plants after being invaded by some very unique organisms.
22. Galls have range of causers including viruses, fungi, bacteria, insects, and mites.
23. Usually gall causers in some way attack or penetrate the plant's growing tissues
24. and causes the host to reorganize its cells and develop into an abnormal growth.

(c) Desertification

25. Process of land degradation

26. In arid, semi arid and dry sub-humid areas resulting from various factors including climate variations and human activities.

27. Main driving forces are

28. Climate variations

29. Human activities

30. Deforestation is another main factor.

31. Reduction of rainfall, precipitation, soil humidity,
Water recharge of underground reservoirs are
Directly influenced by deforestation.

} Any 2

32. Over – exploitation of water and soil

33. Uncontrolled mining

34. Excessive use of agro - chemical products

35. Poor land management practices

36. Decrease in ecosystem services and reduced biodiversity in affected areas.

37. Decrease in vegetation cover induce water scarcity.

38. Destruction of habitats of animal and plant species.

39. Reduces the agricultural activities mainly the growth of crop species.

40. It presents a serious impact on the human well being and health of the people living in the areas affected by droughts and land degradation.

41. It affects the food security of people as well as for animals.

42. Carbon storage capacity of plants and soils will also be reduced in the long run.

Any 38 x 4 = 152

Maximum marks = 150

(c) Tissue culture

25. In general cell or tissue culture is culture of free living cells or group of similar cells
26. More specifically, tissue culture is the ability to establish plant tissues (cells, callus, and protoplasts), plant organs (embryos, shoots, roots)
27. In aseptic, in vitro culture
28. the most common benefit of tissue culture is that of cloning or mass production of genetically identical organisms.
29. Main concept behind plant tissue culture is "totipotent."
30. A single cell has the genetic programme to grow into an entire new plant.
31. A tissue culture medium generally consists of inorganic salts,
32. Organic substances
33. Water
34. Gelling agent
35. Macronutrients and micronutrients in appropriate ratios make the inorganic salt component.
36. The organic substances include carbon energy source (usually sucrose), plant growth regulators (cytokinins and auxins), vitamins, miscellaneous compounds.
37. Agar is incorporated as the gelling agent.
38. These gels provide physical support for the explant.
39. And increase the aeration of the medium.

Importance

- Rapid multiplication of clones
- Mass propagation of specific clones
- Genetic uniformity
- Genotype modifications
- Ability to produce plants in large numbers in a small space.
- Production of pathogen - free plants
- All year around production of plants
- Ability to produce plants which do not produce viable seeds

Any 2
40, 41

42. Examples for tissue – cultured plants ;

- Anthurium (*Anthurium andraeanum*)
- Banana
- Pineapple
- Dragon fruit

Any 1

Any 38 x 4 = 152
Maximum marks = 150