



PRE-MEDICINE ASSOCIATION

2020/2021

Kuvempu

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கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021
General Certificate of Education (Adv. Level) Examination, 2021

Biology I

09 E I

Two Hours

Instructions:

- ◆ Answer all the 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 (x) 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 a false statement?

- (1) All organisms begin their life as a single cell.
- (2) Plants are the primary producers in the world.
- (3) Sustainable food production is the production of sufficient amount of food for the human population using any method.
- (4) Birds and fish have a streamlined body.
- (5) The first formed organisms in the earth are believed to be heterotrophic, anaerobic prokaryotes.

2. Select the incorrect statement.

- (1) One ATP molecule releases 30.5 kJ.
- (2) Most biological reactions use energy released by the first phosphate bond upon hydrolysing.
- (3) As ATP molecule is immobile, it is only used in local reactions within a cell.
- (4) Using ADP and inorganic phosphate ATP can be produced.
- (5) ATP is a nucleotide and it has a deoxyribose sugar molecule.

3. Correct statement regarding chlorophyll,

- (1) When absorbing light, reduction of chlorophyll and oxidation of electron acceptor take place.
- (2) Photoprotection is the main function of chlorophyll.
- (3) Plant leaf appear in green colour due to absorption of green light.
- (4) Chlorophyll 'a' molecule in the reaction centre of photosystem II absorb light energy of 700 nm wave-length efficiently.
- (5) Chlorophyll 'a' molecule directly involves in the light reaction of photosynthesis.

4. What is the correct statement regarding lipids?

- (1) It is a macro-molecule.
- (2) Triacylglycerol has 3 groups of glycerol.
- (3) Some lipids do not act as signalling molecules.
- (4) Hydrocarbon chains in fatty acids contribute to the hydrophobic nature of fatty acids.
- (5) There are no double bonds in unsaturated fatty acids.

5. What is the incorrect statement regarding cellular respiration?

- (1) Pyruvate molecules enter to the mitochondria only when oxygen is available.
- (2) Pyruvate molecules are transported into the mitochondria actively.
- (3) Glycolysis and oxidation of pyruvate take place in the cytoplasm.
- (4) In the mitochondrial matrix pyruvate converts into acetyl groups.
- (5) Two NADH molecules are produced in the link reaction.

6. Correct statement regarding peroxisomes,

- A – Detoxification of peroxides.
- B – Storage of Ca^{2+} (calcium ions).
- C – Photorespiration in plants.
- D – Double membranous structure with oxidation enzymes.

- (1) A, C
- (2) A, B, D
- (3) A, B, C
- (4) A, C, D
- (5) C, D

7. What is not found in the organelle given?

- (1) Starch granules.
- (2) Lipid droplets.
- (3) Phosphate granules.
- (4) Circular DNA.
- (5) Enzymes.



8. Some features of an organism is given below.

- (a) Dominant plant – Gametophytic plant which is independent and photosynthetic.
- (b) Sporophytic plant – Younger plant is green in colour and have stomata. Dependent. Homosporous.

- (1) *Nephrolepis*
- (2) *Selaginella*
- (3) *Cycas*
- (4) *Pogonatum*
- (5) *Ulva*

9. Select the mismatched sequence regarding the scientists involved in classification and their discovery.

- (1) Ernest Haeckel – Introduction of kingdom Protista.
- (2) Aristotle – Classification of organisms based on mode of locomotion and presence or absence of red blood cells.
- (3) Theophrastus – Classification of animals based on life span.
- (4) Carolus Linnaeus – Introduction of kingdom Plantae and Animalia.
- (5) Robert H. Whittaker – Introduction of five kingdom classification.

10. Select the correct answer.

- (1) Earth and the other planets of the solar system were formed 4.6 million years ago.
- (2) Atmosphere of the early earth had a little amount of water vapour.
- (3) The early atmosphere was with no molecular oxygen.
- (4) RNA accumulate into lipid bound vesicles to produce protocell.
- (5) Growth of the cell occurred by the addition of protein to the membrane by collision of micelles.

11. Select the correct answer.

- (1) The concentration of atmospheric oxygen begins to increase in the Hadean eon.
- (2) Oldest fossils of prokaryotic cells appeared in Proterozoic eon.
- (3) First seed plant appeared in Palaeozoic era.
- (4) Diversification of early vascular plants took place in Mesozoic era.
- (5) Proterozoic eon has 3 eras namely, Palaeozoic, Mesozoic and Cenozoic.

12. Select the correct answer.

- (1) Fungal cell wall is made up of flexible polysaccharide called cutin.
- (2) Fungi without septa are known as coenocytic.
- (3) *Chytridium* produce zoospores which are ciliated.
- (4) *Mucor* shows only sexual reproduction.
- (5) Most of the fungi included into the phylum Ascomycota produce ascocarps enclosing asci.

13. A – Sieve tube elements are consist of cytoskeletal elements.

B – Companion cells conduct water.

C – Cytoplasm of the sieve tube elements are reduced into a thin layer.

D – All the gymnosperms are consist of sieve tube elements.

What is the false statement regarding the phloem tissue?

- (1) A and B only.
- (2) A and D only.
- (3) C and D only.
- (4) A, B and D only.
- (5) All the above.

14. What is the correct statement regarding secondary growth?

- (1) It occurs as a result of the new cells produced by intercalary meristems.
- (2) The short initials of the vascular cambium are parallel to the axis of stem or root.
- (3) Cork cambium is formed by a cell layer of the cortex in roots.
- (4) Lenticels are present as vertical slits in the periderm.
- (5) All the tissues out of the vascular cambium belong to bark.

15. Deficiency of certain elements can cause chlorosis between veins, particularly in young leaves. What are those elements?

- (1) Mg and Mo
- (2) S and Ni
- (3) Fe and Mn
- (4) Fe and Mo
- (5) S and N

16. What is the true statement regarding plant life cycles?

- (1) In gametophytes of *Nephrolepis*, antheridia and archegonia are developed on the dorsal side.
- (2) In sporophytes of *Selaginella*, a large number of megaspores are produced by the megasporangium.
- (3) *Cycas* seeds contain a haploid endosperm.
- (4) Seeds of angiosperms do not contain a triploid endosperm.
- (5) Microsporophylls of *Cycas* are composed of microsporangia on the upper surface.

17. What is the false statement regarding plant growth substances?

- (1) Auxin enhances apical dominance.
- (2) Cytokinins stimulates seed germination.

- (3) Gibberellin stimulates fruit growth.
- (4) Abscisic acid delays leaf senescence.
- (5) Ethylene promotes leaf abscission.

18. What is correct regarding methods of water and solute movements?

- (1) Active transport requires ATP and it occurs spontaneously.
- (2) Sometimes, bulk flow occurs through membranes.
- (3) Movement of a population of molecules by diffusion is directional.
- (4) Free water molecules do not bind to surfaces but may bind with solutes.
- (5) Absorption of water molecules by the cellulose cell walls, is an example for imbibition.

19. When two cells A and B with the same water potential (ψ_p) and pressure potential ($\psi_p = +0.5$ MPa) are placed in a sucrose solution and distilled water separately.

Cell A – Doesn't swell or shrink.

Cell B - $\psi_p = 2.1$ MPa

- (1) $\psi_p = \psi - \psi_s$
- (2) Initial water potential of A and B cells is -1.6 MPa.
- (3) When water enters cell B, its water potential increases.
- (4) Solute potential of the sucrose solution is -2.1 MPa.
- (5) The final solute potential of A and B cells is equal.

20. What is the false statement regarding plant responses to internal and external signals?

- (1) Light induced opening of stomata is initiated by blue light photo receptors.
- (2) Shade avoidance is regulated by Phytochrome photoreceptors.
- (3) Exposure to direct sunlight decreases the proportion of, far red : red light.
- (4) Plants get the ability to get adapted to changes in outside light conditions by phytochromes.
- (5) Phototropism is initiated by blue light photo receptors.

21. Choose the correct statement.

- (1) Smooth muscles are situated in the upper part of the oesophagus.
- (2) Pepsin converts proteins to small peptides.
- (3) Emulsification of lipids is a part of mechanical digestion.
- (4) Trypsin and secretin are components of the pancreatic juice.
- (5) All the glucose present in blood convert to glycogen and is stored in the liver.

22. Which of the following cannot be considered as an internal defence in innate immunity of the human body?

- (1) Natural killer cells
- (2) Antimicrobial proteins
- (3) Mucous membranes
- (4) Phagocytic cells
- (5) Inflammatory response

23. Injections of pooled human immunoglobulin from immunized donors or as monoclonal antibodies are considered as,

- (1) Artificially acquired active immunity
- (2) Naturally acquired active immunity
- (3) Artificially acquired passive immunity
- (4) Naturally acquired passive immunity
- (5) None of the above.

24. A child exhibits symptoms such as increased metabolic rate, weight loss and warm sweaty skin. The disease and the hormone causing the disease are respectively,

	Disease	Hormone
(1)	Type 1 diabetes	Insulin
(2)	Type 2 diabetes	Insulin
(3)	Hyperthyroidism	Thyroxin
(4)	Hypothyroidism	Thyroxin
(5)	Cystic fibrosis	Growth hormone

25. Which of the following statement is incorrect regarding the lung volumes and capacities of a healthy male?

- (1) Inspiratory reserve volume = tidal volume \times 5
- (2) Residual volume is higher than the expiratory reserve volume
- (3) Functional residual capacity can be represented as an addition of respiratory volumes.
- (4) Vital capacity is about twice of the residual volume.
- (5) Vital capacity can be represented as an addition of two different respiratory capacities.

26. Which of the following is true regarding nitrogenous excretion of animals?

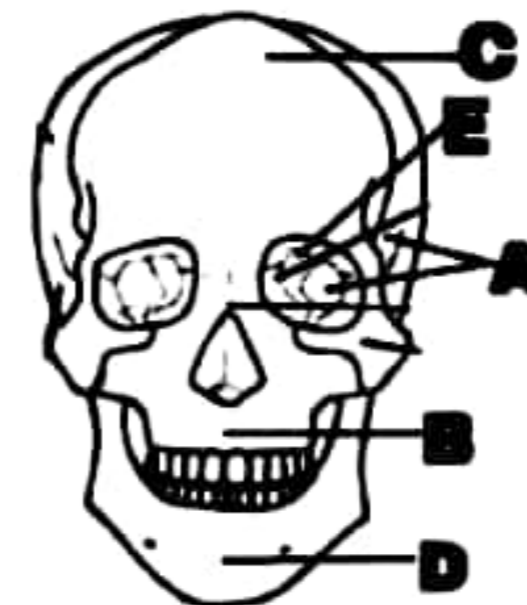
- (1) In some animals NH_3 is the initial Nitrogenous waste product.
- (2) Salt glands of marine birds and marine reptiles are found near the eyes.
- (3) Annelids excrete through blind end tubules immersed in haemolymph which opens to the digestive tract.
- (4) Flame cells of arthropods excrete through pores in the body wall.
- (5) Sharks excrete NH_3 as the main excretory product.

27. Out of the following which is not a common disorder related to the nervous system?

- (1) Parkinson's disease
- (2) Depression
- (3) Cystic fibrosis
- (4) Schizophrenia
- (5) Alzheimer's disease

28. Of the following, what is the event that doesn't take place in the mother during first trimester?

- (1) Ovulation ceases.
- (2) Mother experience morning sickness.
- (3) Secretion of progesterone and oestrogen by corpus luteum.
- (4) Secretion of progesterone and oestrogen by placenta.
- (5) Breast and uterus gets larger.



29. According to the diagram on the right, sinuses are not present in,

- (1) A
- (2) B
- (3) C
- (4) D
- (5) E

30. In a healthy adult complete cardiac cycle lasts for 0.8 s. Time periods taken for ventricular systole, atrial systole and complete cardiac diastole in a complete cardiac cycle in given order,

- (1) 0.2s, 0.3s, 0.4s
- (2) 0.4s, 0.1s, 0.3s
- (3) 0.3s, 0.4s, 0.8s

- (4) 0.3s, 0.1s, 0.4s
- (5) 0.2s, 0.1s, 0.4s

31. In a certain variety of pea, the dominant allele is 'P' of a certain gene gives purple colour to the seeds. The homozygous recessive type gives colourless seeds. Another gene (N) suppresses the expression of colours in seeds. When 2 pea plants which are heterogeneous with respect to both genes are crossed. What is the phenotypic ratio between colourful and colourless seeds?

- (1) 13 : 3
- (2) 5 : 11
- (3) 3 : 13
- (4) 11 : 5
- (5) 1 : 15

32. Not an advantage in medicine due to use of genetically modified organisms (GMOs),

- (1) Manufacturing Hepatitis B vaccine in genetically modified yeast cells.
- (2) Manufacturing vaccines in edible parts of genetically modified plants.
- (3) Extracting factor F8 from tissue cultured GM mammalian cells.
- (4) Treating sickle cell disease using gene therapy.
- (5) Using GM mosquitoes to interfere the lifecycle of malaria parasite.

33. Function of the enzyme is non-matching in,

- (1) Restriction endonucleases – excising a DNA sequence from a restriction site.
- (2) DNA ligase – joining excised DNA fragments taken from different sources.
- (3) Reverse transcriptase – forming a mRNA strand on a complementary DNA strand (cDNA)
- (4) RNA polymerase – allows RNA hybridization by unwinding DNA and exposing the template strand.
- (5) DNA ligase – sealing the gaps of RNA strand by joining the newly synthesised RNA fragments.

34. Not an organism threatened due to overexploitation,

- (1) Kothalahimbutu
- (2) *Lantana*
- (3) Sea cucumber
- (4) Ebony
- (5) Cod fish

35. Which of the following statement is incorrect?

- (1) Flagship species is a species chosen as a symbol or icon to represent an ecosystem in need for conservation.
- (2) Keystone species is a species that that plays a very important role in the stability and functioning of a system.
- (3) Once widespread species, which are now found in very restricted or isolated areas are called relic species.
- (4) Indigenous species is a species that is confined to a particular area or country, and not found growing naturally anywhere else in the world.
- (5) Exotic species is a species that has been introduced from another geographic region to an area outside its natural range due to human activities.

36. Select the correct combination regarding conventions related to conservation of the environment.

- (1) Convention on wetlands – Basel convention.
- (2) International convention for the prevention of pollution from ships – MARPOL convention.
- (3) Convention for the protection of the ozone layer – Kyoto protocol.
- (4) Convention of reducing the emission of greenhouse gasses – Montreal protocol.

(5) Convention on the control of trans boundary movement of hazardous wastes and their disposal – Ramsar convention.

37. Correct regarding the toxins produced by *Salmonella typhi*,

- (1) Part of cellular growth and metabolism.
- (2) Lipopolysaccharides.
- (3) Thermos-labile.
- (4) Interfere with normal transmission of nerve impulses.
- (5) Protein toxins.

38. Which of the following is incorrect regarding mycoplasma and phytoplasma?

- (1) Both can only be seen under electron microscope.
- (2) Phytoplasma infect only plants.
- (3) Phytoplasma can only reproduce in plant body.
- (4) Both of them possess aerobic or facultative anaerobic mode of respiration.
- (5) Mycoplasma don't have flagella.

39. Which of the following is incorrect regarding rhizosphere and mycorrhizae?

- (1) Rhizosphere is considered as the most bio-diverse and dynamic habitat on earth.
- (2) Both rhizosphere and mycorrhizae are symbiotic associations.
- (3) Almost all the land plants have symbiotic association with one or more mycorrhizal fungi.
- (4) Fungi and bacteria are the most numerous organisms in the rhizosphere.
- (5) Mycorrhizae increase the uptake of immobile nutrients like phosphorous and zinc.

40. Adult filarial worm lives in the lymphatic system for,

- (1) 1 – 2 years.
- (2) 2 – 3 years.
- (3) 3 – 4 years.
- (4) 4 – 5 years.
- (5) 5 – 6 years.

● 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)

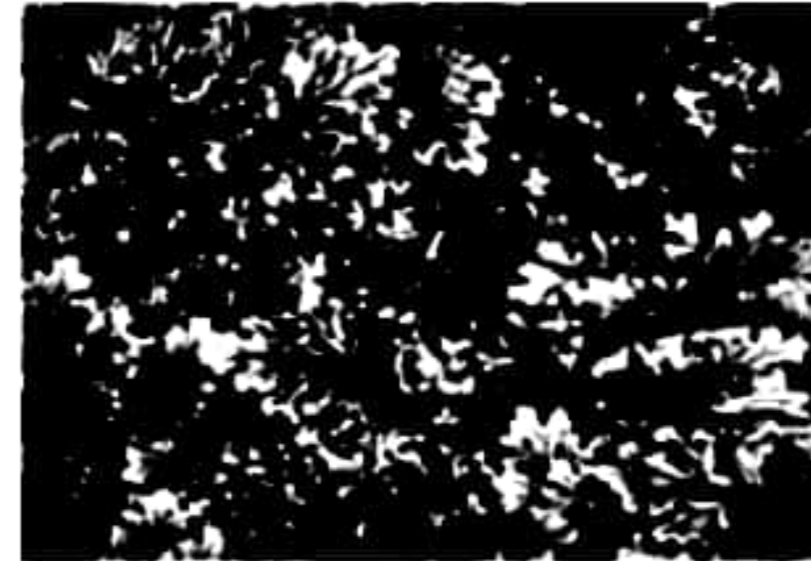
Directions Summarised				
(1)	(2)	(3)	(4)	(5)
(A), (B), (C) correct	(A), (C), (D) correct	(A), (B) correct	(C), (D) correct	Any other response or combination of responses correct.

41. Regard (x) and (y) diagrams given below and find the correct choice/choices from the following.

	(X)	(Y)
(A)	In upright stems small leaves can be found.	In upright stems small leaves can be found.
(B)	They have strobili.	They have strobili.
(C)	Includes to phylum Lycophyta.	Includes to the phylum Pterophyta.
(D)	It is a club moss.	It is a spike moss.
(E)	It is homosporous	It is heterosporous.



(X)



(Y)

42. *Thermococcus* is similar to Eukarya because of,
- (A) Insensitivity to antibiotics.
 - (B) Having unbranched lipids on cell membrane.
 - (C) Having several types of RNA polymerase.
 - (D) Methionine being initiator amino acid for protein synthesis.
 - (E) Living in extreme environmental conditions.
43. What is/are the true statement/s out of the following?
- (A) In dicot stems there is a cluster of sclerenchyma cells outside the vascular bundle.
 - (B) In dicot roots, endodermis involves in the formation of lateral roots.
 - (C) Pericycle in monocot roots is not meristematic.
 - (D) In the primary stage of dicot plant stem, a large pith which is made up of parenchyma cells can be found, inner to vascular bundles.
 - (E) Both heart wood and sap wood transports water.
44. Which of the following mineral – function pair/s is/are correct?
- (A) Ca – Form bones and teeth.
 - (B) S – Component of amino acids.
 - (C) K – Nerve function.
 - (D) Mg – Enzyme cofactor.
 - (E) Fe – Maintain acid base balance.
45. Which of the following is/are auto immune disease/s?
- (A) Multiple sclerosis
 - (B) Type 1 diabetes mellitus
 - (C) Type 2 diabetes mellitus
 - (D) Rheumatoid arthritis
 - (E) Allergy
46. Which of the following statement/s is/are incorrect?
- (A) Parathyroid glands are embedded in the anterior surface of thyroid gland.
 - (B) Glucocorticoid cortisol and mineralocorticoid aldosterone are 2 hormones produced by adrenal cortex which mediate short term stress responses.
 - (C) Melanin inhibits growth and development of reproductive organs before puberty.
 - (D) Hormones secreted by anterior pituitary has tropic as well as non-tropic effects.
 - (E) Hormones produced by adrenal medulla contribute in decreasing the metabolic rate.
47. Incorrect statement/s regarding breeding techniques is/are,
- (A) Polyploid plants show a slow growth rate compared to their diploid plants.
 - (B) Continuous interbreeding may reduce genetic fitness of a population.
 - (C) Hybridization is the mating of genetically related, purebred plants or animals.

- (D) In mutation breeding, ionizing radiations such as gamma rays, protons, neutrons, alpha and beta particles, and chemicals such as colchicine to cause mutations.
- (E) Outbreeding allows transmission of desirable characters of exotic parent to the progeny that are absent in indigenous parent.

48. What is/are correct statement/s from the following?

- (A) In polypeptide synthesis, transcription means converting the information in mRNA to a sequence of amino acids.
- (B) Primase is a type of DNA polymerase.
- (C) A DNA probe is a fragment of double stranded labelled DNA.
- (D) Highly variable polymorphism is a disadvantage of using STR markers.
- (E) Non-disjunction in meiosis II causes Down syndrome.

49. Which of the following statement/s is/are incorrect regarding biomes?

- (A) Succulent plants and thorny shrubs can be seen in Savanna.
- (B) Chaparral typically consist of dwarf forests and shrubs.
- (C) Temperate grasslands have rainy winter and dry summer.
- (D) Herbs in savanna have thorn shaped leaves to be protected from herbivores.
- (E) A permafrost layer can be seen in soil of tundra.

50. Which of the following is/are correct?

- (A) Coliform bacteria is used as an indicator organism to test drinking water quality.
- (B) Coliforms are anaerobic or facultative anaerobic.
- (C) They can ferment lactose to form gas within 8 hours in a lactose broth medium at 35°C.
- (D) Coliforms are pathogenic in the intestine.
- (E) Coliforms are gram negative, non-endospore forming and spiral shape bacteria.



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கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021
General Certificate of Education (Adv. Level) Examination, 2021

Biology II

09 E II

Three Hours

Instructions:

- ◆ This paper consists of 10 questions in 13 pages.
- ◆ The question paper comprises Part A and Part B. The time allocated for both parts is three hours.

PART A – Structured Essay (Pages 1 - 11)

- ◆ 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 12)

- ◆ 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.

Part A – Structured Essay
Answer all questions on this paper itself.
(Each question carries 100 marks.)

01.

(A)

- (I) Nucleic acid is one of the main organic compound in the organisms. State two types of nucleic acids found in an organism.

.....
.....

- (II) What are the main components of a nucleotide?

.....

(III)

- (a) What are the two types of nitrogenous bases?

.....

- (b) Which group of the nucleic acid give its acidic nature?

.....

(IV)

(a)

- (1) What are the components of ATP?

.....

.....

Do not
write
in this
column

.....
(2) What are the types of phosphorylation according to the source of energy?

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

(3) Write two importance of meiosis.

.....
.....

(b) What is respiratory quotient (RQ)?

.....
.....

(c) State two differences between aerobic respiration and anaerobic respiration.

.....
.....

(d) Who is the first electron and H⁺ acceptor in anaerobic respiration?

.....

(B)

(I)

(i) Define the "protocell".

.....

(ii) Write 3 special abilities of protocells.

.....

(iii) Write the eon and era in which the first seed plants were originated.

Eon -

Era -

(II)

(a) What are the two principles which gave rise to the theory of Lamarck?

.....
.....

(b) Write the steps of the process of natural selection in the correct order.

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

(c) Write two characteristics which are used in natural selection.

.....
.....

(III)

(a) Write the organisms of the kingdom Protista which represent the following features.

(i) Aquatic. Unicellular, having glass-like wall, consists of two parts that overlap -

(ii) Chloroplasts present. Have flagella and eye spots -

(b) Write two distinguishing features of seed plants.

.....
.....

(IV)

(a) To which phylum does the fungi with dikaryotic mycelium as the dominant stage of life cycle and having exogenous spores belong to?

.....

(b) Write 3 characteristics of organisms of the phylum Chordata.

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

(C)

(i) What is secondary growth?

.....
.....

(ii) State the plant growth regulators involved in each following events.

(a) Stimulate pollen development

.....

(b) Promote movement of nutrients into sink tissues

.....

(c) Promote desiccation tolerance

.....

(d) Function in gravitropism

.....

(e) Promote root and root hair formation

.....

(III)

(a) Three routes are involved in the radial transport of a plant. What are they?

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

(b) Write five factors that affect the rate of transpiration.

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



02.

(A)

(I)

(a) What are the two types of heterotrophic nutrition?

.....
.....

(b) Name the stages of holozoic nutrition.

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

(II) Write down the ways of protecting the stomach lining from the digestion of HCl and pepsin.

.....
.....

(III)

(a) Name the places where digestion starts of the below mentioned nutrients.

(1) Polysaccharides -

(2) Proteins -

(b) Write down two functions of dietary fibres.

.....
.....

(IV)

(a) Mention two differences between open circulatory system and closed circulatory system.

.....
.....

(b) What are the specialized components consist in the conducting system of the heart?

.....

(V)

(a) What is blood pressure?

.....
.....

(b) What is called stroke volume?

.....
.....

(c) What are the factors reasoning hypotension?

.....
.....

(B)

(I) What is meant by nitrogenous excretion?

.....
.....

(II) In animal world there are different types of nitrogenous excretory products. Write them in ascending order according to energy cost of their production.

.....

(III) Write down relevant excretory products.

(a) Produced by breaking creatinine -

(b) Ratio between acids and bases changed -
leading for the denaturation of proteins

(c) Synthesized by liver and excrete from -
digestive track

(d) Excrete from the bodies of marine fish -
like shark

(e) Excrete by the land snails -

(IV) In animal world there are various excretory structures.

(i) Name the excretory structures given below.

(a)



.....

(b)



.....

(c)



.....

(ii) Name a phylum that shows above given structures.

(a)

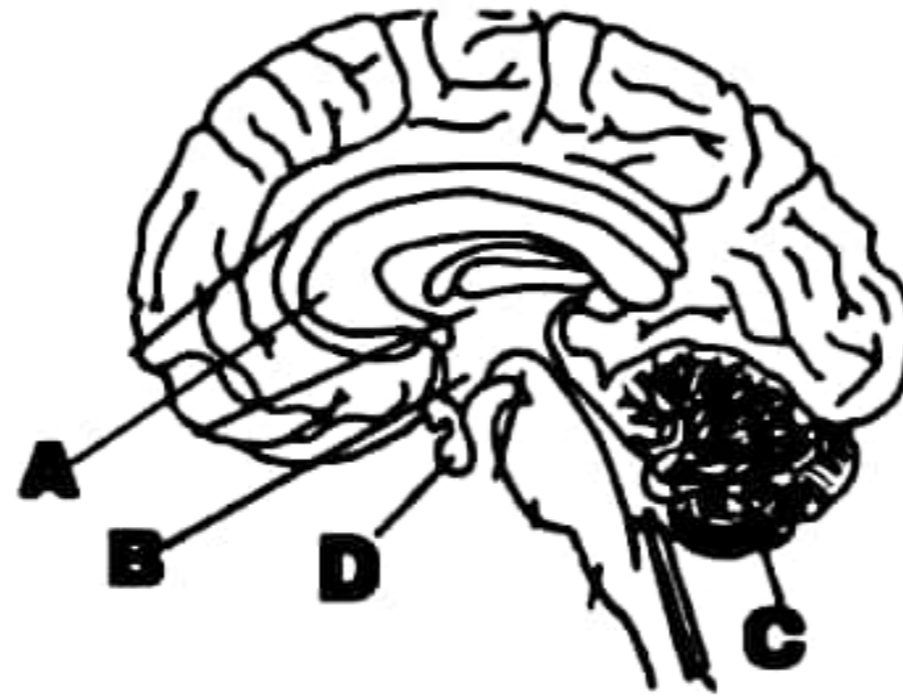
(b)

(c)

(iii) What is excretory structure given above immersed in haemolymph and opens in to the digestive tract?

.....

(C)



(I) Name the above given parts.

A -

B -

C -

D -

(II) What is the function of 'D'?

.....

(III) What are the endocrine glands found in above structures?

.....
.....

(IV) Define endocrine glands.

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

(V) Give the locations of thymus gland and name the hormone secreted by it.

Location -

Hormone -

(VI) Where does synthesis of oxytocin taken place and name the function of oxytocin.

Place of synthesis -

Function -

100

(b) What are the secondary curves that can be seen in typical human vertebral column?

.....
.....

(II) State one difference between axis and a typical cervical vertebra.

.....

(III)

(a) What is intervertebral disc?

.....
.....

(b) State 2 advantages of having intervertebral discs.

.....
.....

(IV)

(a) State the location of Sertoli cells in male reproductive system.

.....
.....

(b) What is the main function of Sertoli cells?

.....
.....

(V) State 2 pituitary hormones which regulate ovulation.

.....
.....

(VI)

(1) What is the function of oxytocin during parturition?

.....
.....

(2) During parturition, which hormone stimulates the formation of oxytocin receptors?

.....

(B)

(I) What is pleiotropy?

.....
.....

(II) State 2 diseases which occur due to pleiotropy.

.....
.....

(III)

(a) What is Hardy – Weinberg equilibrium?

.....
.....

(b) State 4 conditions required for Hardy – Weinberg equilibrium.

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

(c) In a population, the frequency of recessive character is 625 : 1. What is the percentage of heterozygous people in the population for this character?

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

(IV) Error! Bookmark not defined.

(a) State Mendel's 2nd law of inheritance.

.....
.....

(b) In a plant species, yellow flowers (Y) are dominant to white flowers (y) and tall plants (T) are dominant to dwarf plants (t). When a tall yellow flowered plant was crossed with a short white flowered plant, the progeny was as follows.

- Tall yellow flowered plants – 50%
- Tall white flowered plants – 50%

According to the obtained results, determine the genotype of parent plants and progeny.

- (1) Progeny genotypes -
- (2) Parental genotypes -

(C)

(I) Name two vectors used in Recombinant DNA Technology.

.....
.....

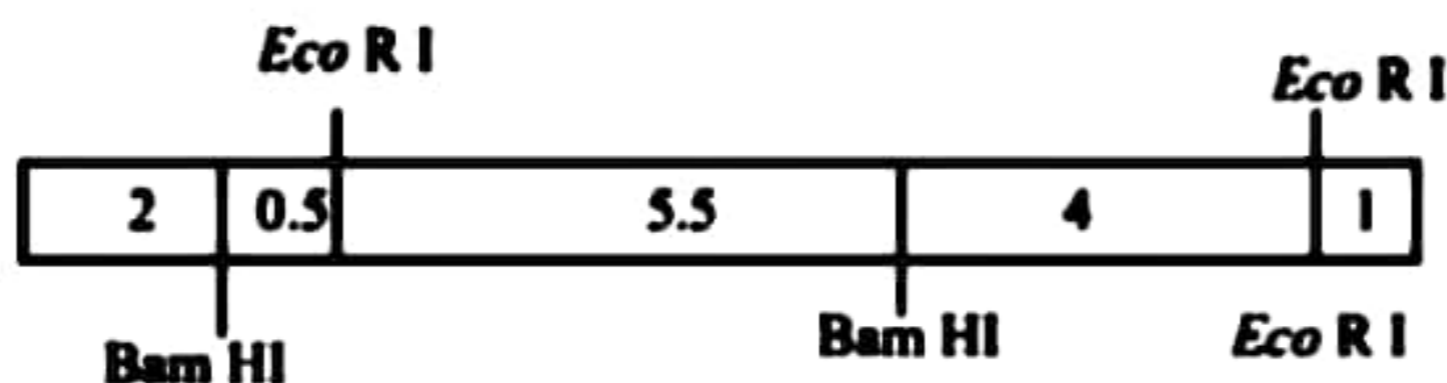
(II) Define the 'vectors' used in Recombinant DNA Technology.

.....
.....

(III) What are 'cloning sites'?

.....
.....

(IV) A restriction map is given below.



(a) Define a restriction map.

.....
.....

(b) How many restriction endonuclease enzymes can be found in the above restriction map?

.....

(c) What is the number of DNA fragments formed, when those enzymes cut the above double stranded DNA?

.....

(V) In packaging of DNA in an eukaryotic cell,

(a) What is the diameter of a nucleosome unit in the first level?

.....

(b) State the name of the stretch of DNA by which the adjoining beads of nucleosomes are linked together.

.....

(c) State the diameter of a chromatid in a mitotic chromosome at the fourth level.

.....



04.

(A)

(i)

(a) Name the organizational levels of the environment.

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

(b) Define the term 'Population'.

.....
.....

(II) Define the term 'Primary production'.

.....
.....

(III) There are three types of ecological pyramids. Name them.

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

(IV) Name two threats to bio diversity.

.....
.....

(V) The principal goal of conservation of organisms is to ensure the long term survival of as many species as possible. State the two ways by which the conservation can be done.

.....
.....

(VI) What is the definition for desertification according to UNCCD?

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

(B)
(I)



(a) Identify the morphological form of the above virus.

.....

(b) Give an example for it.

.....

(c) Give the five distinct steps in the lytic cycle of the virus that you mentioned above.

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

(II) Fill the table using chemical changes take place in food because of microorganisms.

Chemical component in the food	Chemical change	Contributing enzyme	Microorganism group that secrete the enzyme
Protein	(a).....	Proteolytic enzymes	Proteolytic microorganisms
(b).....	Fermentation	(c).....	(d).....
Lipids	(e).....	(f).....	Lipolytic microorganisms

(III) Write two physical changes that may take place in food because of microorganisms.

.....

(C)

(I)

(a) What is tissue culture?

.....

(b) Write 3 importance of tissue culture technique.

.....

(II) Write the group of the disease causing agent for the diseases of fresh water ornamental fish species given below.

- (1) Gill and skin infestation -
- (2) Columnaris disease

(III) What is nanotechnology?

.....

(IV)

(a) There are spherical nanoparticles consisting of a dielectric core to use in the treatment of cancer. What is the name of that spherical nanoparticles?

.....

(b) Write another usage of that spherical nanoparticles.

.....

**

MCQ - Answers

1). 3

2). 4

3). 5

4). 4

5). 3

6). 1

7). 3

8). 4

9). 3

10). 4

11). 3

12). 2

13). 4

14). 5

15). 3

16). 3

17). 4

18). 3

19). 4

20). 3

21). 3

22). 3

23). 3

24). 3

25). 5

26). 3

27). 3

28). 4

29). 4

30). 4

31). 3

32). 2

33). 5

34). 2

35). 4

36). 2

37). 2

38). 3

39). 4

40). 5

41). 5

42). 2

43). 2

44). 2

45). 1

46). 5 (A,B,E)

47). 4 (C,D)

48). 5

49). 2

50). 5 (A,C)

Structured essay - Answers

01 (A) 1. Deoxy ribonucleic acid

Ribo nucleic acid

2. Nitrogenous bases

Pentose sugar

3. (a) Purine

Pyrimidine

(b) Phosphate group

4. (a) 1) Ribose sugar

Adenine nitrogenous base

Three phosphate groups

2) Photophosphorylation

Substrate phosphorylation

Oxidative phosphorylation

3) ~ To maintain constant number of chromosomes through generation in sexually reproducing organisms.

~ Produce genetic variations that leads to evolution.

~ Crossing over , recombination and Independent assortment produce new genetic variations.

(b) Respiratory quotient is the ratio between released volume of CO₂ and absorbed volume of O₂ for a given period of time for a given respiratory substrate.

- (c) ~ Aerobic respiration requires O_2 but anaerobic respiration doesn't need O_2 .**
- ~ During aerobic respiration 32 ATP molecules are produced but in anaerobic respiration 2 ATP molecules are produced.**
 - ~ In aerobic respiration CO_2 and H_2O are the end products but in anaerobic respiration end products are ethanol, CO_2 and Lactic acid.**
 - ~ In aerobic respiration final electron acceptor is molecular O_2 but in anaerobic respiration it is pyruvate and acetaldehyde.**

(d) NAD^+

(B) 1. (a) 1) A cell formed by accumulating RNA into lipid bound vesicles.

2) Enzyme catalyzed reactions

Growth

Evolution

Replication

3) Eon – Phanerozoic eon

Era – Paleozoic era

2. (a) ~ Use and disuse

~ Inheritance of acquired characters

(b) Over production

Variation

Competition and survival of the fittest
Natural selection of favourite traits

(c) Morphological

Anatomical

Cytological

Molecular biological

3. (a) 1. Diatoms

2. Euglena

(b) Production of seed

Reduced gametophyte

Heterospory

Production of ovules and eggs

Production of pollens and sperms

4. (a) Phylum Basidiomycota

(b) ~ Dorsal hollow single nerve cord located dorsal to notochord

~ Pharyngeal gill slits on either side of pharynx

~ Longitudinal , flexible notochord between digestive tube and nerve cord

(c) 1. Increase in the diameter of stems and roots in plants due to the New cells produced by lateral menstems.

2. (a) Gibberellins

- (b) Cytokinins**
- (c) Abscisic acid**
- (d) Auxin**
- (e) Ethylene**

- 3. (a) Apoplastic route**
Symplastic route
Transmembranal route

- (b) Light intensity**
Temperature
Humidity
Wind speed
Availability of soil water
Carbondioxide concentration

- (2) (A) 1. (a) Holozoic nutrition**
Symbiosis

- (b) Ingestion**
Digestion
Absorption
Assimilation
Elimination / Egestion

- 2. ~ Enzymes are secreted in to the lumen as inactive enzymes.**
~ Gastric glands secrete mucous.

~ For every 3 days cell division adds new cell layer in the lining of stomach.

3. (a) 1) Oral cavity
2) Stomach

(b) ~ Provide bulk to the diet and satisfy the appetite.

~ Prevent constipation by attracting water to increase fecal bulk.

~ Stimulate peristalsis leading to defecation.

~ Adequate fibres in the diet protect against some gastro intestinal disorders such as cancers in the colon and rectum.

4. (a) closed circulation

1. Blood is restricted to vessels.
2. Circulatory fluid and interstitial fluid are different.
3. Chemical exchange occurs between blood and then between interstitial fluid and body cells.
4. Relatively high blood pressure.

Open circulation

1. Haemolymph bathes the tissues and organs directly.
2. No difference between circulatory fluid and interstitial fluid.
3. Chemical exchange occurs directly between the haemolymph and body cells.
4. Relatively low blood pressure.

- (b) ~ SA node**
- ~ AV node**
- ~ Bundle of his ,bundle branches and purkinje fibers.**

5 . (a) Force or the pressure which the blood exerts on the walls of the blood vessels.

(b) Amount of blood pumped by ventricles out of the heart in a single contraction .

(c) 1. Shock

2. Dengue hemorrhage fever

3. Standing up suddenly from sitting or lying position

4. Over bleeding (hemorrhage)

5. Fasting

6. Low nutrient

(B) 1. Removal of toxic nitrogenous metabolic waste which were formed as a result of chemical reactions within the body of living organisms.

2. NH_3 (Ammonia) < Urea < Uric acid

3. a) Creatinin

b) NH_3 , CO_2

c) Bile

d) Urea

e) Uric acid

4 . (1) a) Malpighian tubes

b) Flame cells / Flame bulb

c) Nephridia

(2) a) Phylum arthropoda

b) Phylum platyhelminthes

c) Phylum annelida

(3) Malpighian tubes

(C) 1. A – Corpus calosum

B – Hypothalamus

C – Cerebellum

D – Pitutary gland

2 Synthesizes specific hormones

3. Hypothalamus

Pitutary gland

4 ~ Ductless glands

~ Specific group of cells that secrete hormones

~ Hormones directly diffuse in to blood

~ Acted on specific targeted organs / tissues in a distance

**5 . Location – Upper part of the chest , directly behind the sternum
And between lungs.**

Hormone - Thymosin

6 . Location – Hypothalamus

Function – Stimulate secretion of milk.

**03 (A) 1. a) Thoracic curve
Sacral curve**

**b) Cervical curve
Lumbar curve**

2. Axis has an odontoid process

**3. a) A flattened plate located in between adjacent vertebrae,
made up of soft gelatinous and hard cartilaginous material.**

**b) ~ Form strong joints in between adjacent vertebrae
~ Increase flexibility of vertebral column
~ Can act as shock absorbers**

**4. a) On basal membrane of seminiferous tubules inside the
testes.**

**b) ~ Secret inhibin
~ Nourish and provide attachment for cells that are in
different stages of spermatogenesis.**

~ Remove excess cytoplasm when spermatids are converted to sperms.

5 . FSH , LH

6 . 1) Induce and regulate further contraction of uterus during parturition .

2) Estradiol

(B) 1. Expression of multiple phenotypes which are unrelated to each other, due to expression of a single gene.

2. Sick cell anaemia

Cystic fibrosis

3. a) In a non evolving population , allele frequency and genotype frequency remains constant from generation to generation.

b) Absence of mutation

Occurance of random mating

Absence of natural selection

Size of population is extremely large

Absence of emigration or immigration

c) $p^2 + q^2 + 2pq = 1$

Here $q^2 = 1/625$

$$q = 1/25$$

$$p + q = 1$$

$$p = 1 - 1/25$$

$$p = 24/25$$

$$2pq = 24/25 * 1/25 * 2$$

$$\text{Percentage} = 24/25 * 1/25 * 2 * 100 = 7.68 \%$$

4 . a) During gamete formation , alleles segregate and assort Independent of each other.

b) 1) YyTt , yyTt

2) YyTT , yytt

(C) 1. a) bacterial plasmids

b) bacteriophage viruses

c) yeast artificial chromosomes (YACs)

2. Vehicles to carry the DNA of interest in to a host for multiplication or cloning.

3. The sites in the vector , where the DNA to be cloned is inserted.

4 . a) A restriction map is a diagram showing the position of each restriction site with respect to each other and the distance between these sites.

b) two

c) five

5 . a) 10 nm

b) linker DNA

c) 700 nm

04 (A) 1 . a) Individual / organism

Population

Community

Eco – system

Biosphere

b) A group of individuals of the same species , living in the same area and producing fertile offspring through interbreeding.

2 . Primary production is the amount of organic matter produced by autotrophs in a given area during a given period of time.

3. Pyramid of energy

Pyramid of numbers

Pyramid of biomass

4 . Habitat loss / fragmentation

Over exploitation

Pollution

Introduction of invasive alien species

Climate change

5 . In – situ conservation

Ex – situ conservation

6 . Process of land degradation in arid , semi – arid and dry sub - humid areas resulting from various factors , including climatic variations and human activities.

(B) 1 . a) Complex viruses

b) Bacteriophage

c) 1) Attachment

2) Penetration

3) Biosynthesis

4) Maturation and assembly

5) Release

2 . a) Putrefaction

b) Carbohydrates

c) Saccharolytic enzymes (Amylase)

d) Saccharolytic micro organisms

e) Rancidity

f) Lipolytic enzymes

3 . Softening of food

Pigmentation

Ropiness

Slime or gum formation

Toxin accumulation

(C) 1. a) Tissue culture is the ability to establish plant tissues (cells, callus , or protoplasts), plant organs (embryos , shoots, roots) in aseptic in vitro culture.

b) ~ Rapid multiplication of clones

~ Mass propagation of specific clones

~ Genetic

~ 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.

2. 1) Obligatory / opportunistic , gill flukes and skin flukes

2) Bacteria

3. The creation and use of materials and intracellular structures , typically less than 100 nm in size.

4 . Nano shells

5 . use in bio imaging enhancements