

# NEET 2022

## SOLVED PAPER

### SECTION - A (BOTANY)

- The process of translation of *mRNA* to proteins begins as soon as
  - the small subunit of ribosome encounter *mRNA*
  - the larger subunit of ribosome encounters *mRNA*
  - both the subunits join together to bind with *mRNA*
  - the *tRNA* is activated and the larger subunit of ribosome encounters *mRNA*.
- The device which can remove particulate matter present in the exhaust from a thermal power plant is
  - STP
  - incinerator
  - electrostatic precipitator
  - catalytic converter.
- Which of the following is incorrectly matched?
  - Ectocarpus* - Fucoxanthin
  - Ulothrix* - Mannitol
  - Porphyra* - Floridean starch
  - Volvox* - Starch
- Hydrocolloid carrageen is obtained from
  - Chlorophyceae and Phaeophyceae
  - Phaeophyceae and Rhodophyceae
  - Rhodophyceae only
  - Phaeophyceae only.
- Which one of the following statements cannot be connected to predation?
  - It helps in maintaining species diversity in a community.
  - It might lead to extinction of a species.
  - Both the interacting species are negatively impacted.
  - It is necessitated by nature to maintain the ecological balance.
- Given below are two statements :

**Statement I :** The primary  $\text{CO}_2$  acceptor in  $\text{C}_4$  plants is phosphoenol pyruvate and is found in the mesophyll cells.

**Statement II :** Mesophyll cells of  $\text{C}_4$  plants lack RuBisCO enzyme.

In the light of the above statements, choose the correct answer from the options given below :
  - Both Statement I and Statement II are correct.
  - Both Statement I and Statement II are incorrect.
  - Statement I is correct but Statement II is incorrect.
  - Statement I is incorrect but Statement II is correct.
- Which one of the following produces nitrogen fixing nodules on the roots of *Alnus*?
  - Rhizobium*
  - Frankia*
  - Rhodospirillum*
  - Beijerinckia*
- DNA polymorphism forms the basis of
  - genetic mapping
  - DNA fingerprinting
  - both genetic mapping and DNA fingerprinting
  - translation.
- Which one of the following plants does not show plasticity?
  - Cotton
  - Coriander
  - Buttercup
  - Maize
- What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid?
  - Four
  - Six
  - Two
  - Eight
- In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to
  - secretion of secondary metabolites and their deposition in the lumen of vessels
  - deposition of organic compounds like tannins and resins in the central layers of stem
  - deposition of suberin and aromatic substances in the outer layer of stem
  - deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem
  - presence of parenchyma cells, functionally active xylem elements and essential oilsChoose the correct answer from the options given below.
  - (A) and (B) only
  - (C) and (D) only
  - (D) and (E) only
  - (B) and (D) only
- The flowers are zygomorphic in
  - Mustard
  - Gulmohar
  - Cassia*
  - Datura*
  - ChillyChoose the correct answer from the options given below :
  - (A), (B), (C) only
  - (B), (C) only
  - (D), (E) only
  - (C), (D), (E) only

13. What amount of energy is released from glucose during lactic acid fermentation?  
 (a) Approximately 15% (b) More than 18%  
 (c) About 10% (d) Less than 7%
14. The gaseous plant growth regulator is used in plants to  
 (a) speed up the malting process  
 (b) promote root growth and root hair formation to increase the absorption surface  
 (c) help overcome apical dominance  
 (d) kill dicotyledonous weeds in the fields.
15. Identify the incorrect statement related to pollination.  
 (a) Pollination by water is quite rare in flowering plants.  
 (b) Pollination by wind is more common amongst abiotic pollination.  
 (c) Flowers produce foul odours to attract flies and beetles to get pollinated.  
 (d) Moths and butterflies are the most dominant pollinating agents among insects.
16. Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for  
 (a) population explosion  
 (b) competition  
 (c) biodiversity loss  
 (d) natality.
17. The appearance of recombination nodules on homologous chromosomes during meiosis characterises  
 (a) synaptonemal complex  
 (b) bivalent  
 (c) sites at which crossing over occurs  
 (d) terminalisation.
18. Production of cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants  
 (a) ABA (b) gibberellin  
 (c) ethylene (d) cytokinin.
19. Which of the following is not a method of *ex situ* conservation?  
 (a) *In vitro* fertilisation (b) National parks  
 (c) Micropropagation (d) Cryopreservation
20. Which one of the following statement is not true regarding gel electrophoresis technique?  
 (a) The process of extraction of separated DNA strands from gel is called elution.  
 (b) The separated DNA fragments are stained by using ethidium bromide.  
 (c) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.  
 (d) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.
21. Read the following statements and choose correct statements.  
 (A) Euchromatin is loosely packed chromatin.  
 (B) Heterochromatin is transcriptionally active.  
 (C) Histone octamer is wrapped by negatively charged DNA in nucleosome.  
 (D) Histones are rich in lysine and arginine .
- (E) A typical nucleosome contains 400 bp of DNA helix. Choose the correct answer from the option given below.  
 (a) (B), (D), (E) only (b) (A), (C), (D) only  
 (c) (B), (E) only (d) (A), (C), (E) only
22. Match list-I with list-II.
- | List-I        | List-II  |
|---------------|--|
| (A) Manganese | (i) Activates the enzyme catalase                          |
| (B) Magnesium | (ii) Required for pollination germination                  |
| (C) Boron     | (iii) Activates enzymes of respiration                     |
| (D) Iron      | (iv) Functions in splitting of water during photosynthesis |
- Choose the correct answer from the options given below :  
 (a) (A) – (iii), (B) – (iv), (C) – (i), (D) – (ii)  
 (b) (A) – (iv), (B) – (iii), (C) – (ii), (D) – (i)  
 (c) (A) – (iv), (B) – (i), (C) – (ii), (D) – (iii)  
 (d) (A) – (iii), (B) – (i), (C) – (ii), (D) – (iv)
23. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).  
**Assertion (A)** : Polymerase chain reaction is used in DNA amplification.  
**Reason (R)** : The ampicillin resistant gene is used as a selectable marker to check transformation.  
 In the light of the above statements, choose the correct answer from the options given below.  
 (a) Both (A) and (R) are correct and (R) is the correct explanation of (A).  
 (b) Both (A) and (R) are correct but (R) is not the correct explanation of (A).  
 (c) (A) is correct but (R) is not correct.  
 (d) (A) is not correct but (R) is correct.
24. Which one of the following never occurs during mitotic cell division?  
 (a) Spindle fibres attach to kinetochores of chromosomes  
 (b) Movement of centrioles towards opposite poles  
 (c) Pairing of homologous chromosomes  
 (d) Coiling and condensation of the chromatids
25. Which of the following is not observed during apoplastic pathway?  
 (a) Movement of water occurs through intercellular spaces and wall of the cells.  
 (b) The movement does not involve crossing of cell membrane.  
 (c) The movement is aided by cytoplasmic streaming.  
 (d) Apoplast is continuous and does not provide any barrier to water movement.
26. Given below are two statements.  
**Statement I** : Cleistogamous flowers are invariably autogamous.  
**Statement II** : Cleistogamy is disadvantageous as there is no chance for cross pollination.  
 In the light of the above statements, choose the correct answer from the options given below :  
 (a) Both Statement I and Statement II are correct.  
 (b) Both Statement I and Statement II are incorrect.

- (c) Statement I is correct but Statement II is incorrect.  
 (d) Statement I is incorrect but Statement II is correct.
27. "Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which  
 (a) water is transported  
 (b) food is transported  
 (c) for both water and food transportation  
 (d) osmosis is observed.
28. XO type of sex determination can be found in  
 (a) *Drosophila* (b) Birds  
 (c) Grasshoppers (d) Monkeys.
29. Read the following statements about the vascular bundles.  
 (A) In roots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii.  
 (B) Conjoint closed vascular bundles do not possess cambium  
 (C) In open vascular bundles, cambium is present in between xylem and phloem  
 (D) The vascular bundles of dicotyledonous stem possess endarch protoxylem  
 (E) In monocotyledonous root, usually there are more than six xylem bundles present  
 Choose the correct answer from the options given below.  
 (a) (A), (B) and (D) only  
 (b) (B), (C), (D) and (E) only  
 (c) (A), (B), (C) and (D) only  
 (d) (A), (C), (D) and (E) only
30. Which one of the following plants shows vexillary aestivation and diadelphous stamens?  
 (a) *Colchicum autumnale* (b) *Pisum sativum*  
 (c) *Allium cepa* (d) *Solanum nigrum*
31. Given below are two statements.  
**Statement I** : Decomposition is a process in which the detritus is degraded into simpler substances by microbes.  
**Statement II** : Decomposition is faster if the detritus is rich in lignin and chitin.  
 In the light of the above statements, choose the correct answer from the options given below :  
 (a) Both Statement I and Statement II are correct.  
 (b) Both Statement I and Statement II are incorrect.  
 (c) Statement I is correct but Statement II is incorrect.  
 (d) Statement I is incorrect but Statement II is correct.
32. Identify the correct set of statements :  
 (A) The leaflets are modified into pointed hard thorns in *Citrus* and *Bougainvillea*  
 (B) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin  
 (C) Stem is flattened and fleshy in *Opuntia* and modified to perform the function of leaves  
 (D) *Rhizophora* shows vertically upward growing roots that help to get oxygen for respiration  
 (E) Subaerially growing stems in grasses and strawberry help in vegetative propagation.  
 Choose the correct answer from the options given below :  
 (a) (B) and (C) only  
 (b) (A) and (D) only  
 (c) (B), (C), (D) and (E) only  
 (d) (A), (B), (D) and (E) only
33. Exoskeleton of arthropods is composed of  
 (a) cutin (b) cellulose  
 (c) chitin (d) glucosamine.
34. Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis? It involves  
 (a) breakdown of proton gradient  
 (b) breakdown of electron gradient  
 (c) movement of protons across the membrane to the stroma  
 (d) reduction of NADP to NADPH<sub>2</sub> on the stroma side of the membrane.
35. Given below are two statements.  
**Statement I** : Mendel studied seven pairs of contrasting traits in pea plants and proposed the laws of inheritance.  
**Statement II** : Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height.  
 In the light of the above statements, choose the correct answer from the options given below.  
 (a) Both Statement I and Statement II are correct  
 (b) Both Statement I and Statement II are incorrect  
 (c) Statement I is correct but Statement II is incorrect  
 (d) Statement I is incorrect but Statement II is correct

### SECTION - B (BOTANY)

Attempt any 10 questions out of 15

36. Match the plant with the kind of life cycle it exhibits.
- | <b>List-I</b>        | <b>List-II</b>   |
|----------------------|--|
| (A) <i>Spirogyra</i> | (i) Dominant diploid sporophyte, vascular plant, with highly reduced male or female gametophyte  |
| (B) Fern             | (ii) Dominant haploid free living gametophyte  |
| (C) <i>Funaria</i>   | (iii) Dominant diploid sporophyte alternating with reduced gametophyte called prothallus         |
| (D) <i>Cycas</i>     | (iv) Dominant haploid leafy gametophyte alternating partially dependent multicellular sporophyte |
- Choose the correct answer from the option below :  
 (a) (A) – (iv), (B) – (i), (C) – (ii), (D) – (iii)  
 (b) (A) – (ii), (B) – (iii), (C) – (iv), (D) – (i)  
 (c) (A) – (iii), (B) – (iv), (C) – (i), (D) – (ii)  
 (d) (A) – (ii), (B) – (iv), (C) – (i), (D) – (iii)
37. The anatomy of springwood shows some peculiar features. Identify the correct set of statement about springwood.  
 (A) It is also called as the earlywood.  
 (B) In spring season cambium produces elements with narrow vessels.  
 (C) It is lighter in colour.  
 (D) The springwood along with autumn shows alternate concentric rings for annual rings.  
 (E) It has lower density.

Choose the correct answer from the options below.

- (a) (A), (B), (D) and (E) only
- (b) (A), (C), (D) and (E) only
- (c) (A), (B) and (D) only
- (d) (C), (D) and (E) only

38. In the following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme?

- (a) 5' G A T A C T 3' ; 3' C T A T G A 5'
- (b) 5' G A A T T C 3' ; 3' C T T A A G 5'
- (c) 5' C T C A G T 3' ; 3' G A G T C A 5'
- (d) 5' G T A T T C 3' ; 3' C A T A A G 5'

39. While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (-) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (-) for another species involved in the interaction?

- (a) Predation (b) Amensalism
- (c) Commensalism (d) Competition

40. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

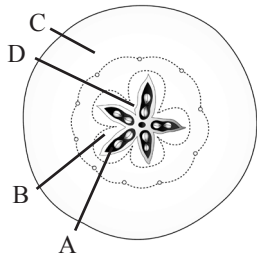
**Assertion (A) :** Mendel's law of independent assortment does not hold good for the genes that are located closely on the same chromosome.

**Reason (R) :** Closely located genes assort independently.

In the light of the above statements, choose the correct answer from the options given below :

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (b) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (c) (A) is correct but (R) is not correct.
- (d) (A) is not correct but (R) is correct.

41. Which part of the fruit, labelled in the given figure makes it a false fruit?



- (a) A → Mesocarp (b) B → Endocarp
- (c) C → Thalamus (d) D → Seed

42. Match list-I with list-II.

- | List-I                     | List-II  |
|----------------------------|--|
| (A) Metacentric chromosome | (i) Centromere situated close to the end forming one extremely short and one very long arm |
| (B) Acrocentric chromosome | (ii) Centromere at the terminal end  |
| (C) Sub-metacentric        | (iii) Centromere in the middle forming two equal arms of chromosomes                       |
| (D) Telocentric chromosome | (iv) Centromere slightly away from the middle forming one shorter arm and one longer arm   |

Choose the correct answer from the options given below.

- (a) (A)-(iii), (B)-(i), (C)-(iv), (D)-(ii)
- (b) (A)-(i), (B)-(iii), (C)-(ii), (D)-(iv)
- (c) (A)-(ii), (B)-(iii), (C)-(iv), (D)-(i)
- (d) (A)-(i), (B)-(ii), (C)-(iii), (D)-(iv)

43. Addition of more solutes in a given solution will

- (a) raise its water potential
- (b) lower its water potential
- (c) make its water potential zero
- (d) not affect the water potential at all.

44. Which one of the following will accelerate phosphorus cycle ?

- (a) Burning of fossil fuels (b) Volcanic activity
- (c) Weathering of rocks (d) Rain fall and storms

45. Which of the following occurs due to the presence of autosomal dominant trait ?

- (a) Sickle cell anaemia (b) Myotonic dystrophy
- (c) Haemophilia (d) Thalassemia

46. Read the following statements on lipids and find out correct set of statement.

- (A) Lecithin found in the plasma membrane is a glycolipid
- (B) Saturated fatty acids possess one or more C = C bonds
- (C) Gingelly oil has lower melting point, hence remains as oil in winter
- (D) Lipids are generally insoluble in water but soluble in some organic solvents
- (E) When fatty acid is esterified with glycerol, monoglycerides are formed

Choose the correct answer from the options given below.

- (a) (A), (B) and (C) only (b) (A), (D) and (E) only
- (c) (C), (D) and (E) only (d) (A), (B) and (D) only

47. What is the role of large bundle sheath cells found around the vascular bundles in  $C_4$  plants ?

- (a) To provide the site for photorespiratory pathway
- (b) To increase the number of chloroplast for the operation of Calvin cycle
- (c) To enable the plant to tolerate high temperature
- (d) To protect the vascular tissue from high light intensity

48. The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is false?

- (a) CNG burn more efficiently than diesel.
- (b) The same diesel engine is used in CNG buses making the cost of conversion low.
- (c) It is cheaper than diesel.
- (d) It cannot be adulterated like diesel.

49. Transposons can be used during which one of the following?

- (a) Polymerase Chain Reaction
- (b) Gene silencing
- (c) Autoradiography
- (d) Gene sequencing

50. If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of function to different segments, the methodology adopted by him is called as

- (a) sequence annotation (b) gene mapping
- (c) expressed sequence tags (d) bioinformatics.

**SECTION - A (ZOOLOGY)**

51. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as reason (R).  
**Assertion (A)** : Osteoporosis is characterised by decreased bone mass and increased chances of fractures.  
**Reason (R)** : Common cause of osteoporosis is increased levels of estrogen.  
 In the light of the above statements, choose the inappropriate answer from the options given below
- Both (A) and (R) are correct but (R) is not the correct explanation of (A)
  - (A) is correct but (R) is not correct
  - (A) is not correct but (R) is correct
  - Both (A) and (R) are correct and (R) is correct explanation of (A)
52. A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is  $C_6H_{12}O_6$  then what is the formula for maltose?
- $C_{12}H_{20}O_{10}$
  - $C_{12}H_{24}O_{12}$
  - $C_{12}H_{22}O_{11}$
  - $C_{12}H_{24}O_{11}$
53. In which of the following animals, digestive tract has additional chambers like crop and gizzard?
- Corvus, Columba, Chameleon*
  - Bufo, Balaenoptera, Bangarus*
  - Catla, Columba, Crocodilus*
  - Pavo, Psittacula, Corvus*
54. Select the incorrect statement with reference to mitosis.
- All the chromosomes lie at the equator at metaphase.
  - Spindle fibres attach to centromere of chromosomes.
  - Chromosomes decondense at telophase.
  - Splitting of centromere occurs at anaphase.
55. Which of the following statements with respect to endoplasmic reticulum is incorrect?
- RER has ribosomes attached to ER
  - SER is devoid of ribosomes
  - In prokaryotes only RER are present
  - SER are the sites for lipid synthesis
56. Regarding meiosis, which of the statements is incorrect?
- There are two stages in meiosis, meiosis-I and II.
  - DNA replication occurs in S phase of meiosis-II.
  - Pairing of homologous chromosomes and recombination occurs in meiosis-I.
  - Four haploid cells are formed at the end of meiosis-II.
57. Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called
- bio-magnification
  - bio-remediation
  - bio-fortification
  - bio-accumulation.
58. Tegmina in cockroach, arises from
- prothorax
  - mesothorax
  - metathorax
  - prothorax and mesothorax.
59. Given below are two statements.  
**Statement I** : Fatty acids and glycerols cannot be absorbed into the blood.  
**Statement II** : Specialised lymphatic capillaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.  
 In the light of the above statements, choose the most appropriate answer from the options given below.
- Both Statement I and Statement II are correct
  - Both Statement I and Statement II are incorrect
  - Statement I is correct but Statement II is incorrect
  - Statement I is incorrect but Statement II is correct
60. Given below are two statements.  
**Statement I** : The release of sperms into the seminiferous tubules is called spermiation.  
**Statement II** : Spermiogenesis is the process of formation of sperms from spermatogonia.  
 In the light of the above statements, choose the most appropriate answer from the options given below.
- Both Statement I and Statement II are correct
  - Both Statement I and Statement II are incorrect
  - Statement I is correct but Statement II is incorrect
  - Statement I is incorrect but Statement II is correct
61. *In-situ* conservation refers to
- protect and conserve the whole ecosystem
  - conserve only high risk species
  - conserve only endangered species
  - conserve only extinct species.
62. Given below are two statements.  
**Statement I** : Mycoplasma can pass through less than 1 micron filter size.  
**Statement II** : Mycoplasma are bacteria with cell wall.  
 In the light of the above statements, choose the most appropriate answer from the options given below.
- Both Statement I and Statement II are correct.
  - Both Statement I and Statement II are incorrect.
  - Statement I is correct but Statement II is incorrect.
  - Statement I is incorrect but Statement II is correct.
63. Which of the following is a correct match for disease and its symptoms?
- Arthritis-Inflamed joints
  - Tetany - High  $Ca^{2+}$  level causing rapid spasms
  - Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle
  - Muscular dystrophy - An autoimmune disorder causing progressive degeneration of skeletal muscle
64. Given below are two statements:  
**Statement I** : Autoimmune disorder is a condition where body defense mechanism recognizes its own cells as foreign bodies.  
**Statement II** : Rheumatoid arthritis is a condition where body does not attack self cells.  
 In the light of the above statements, choose the most appropriate answer from the options given below:
- Both Statement I and Statement II are correct
  - Both Statement I and Statement II are incorrect
  - Statement I is correct but Statement II is incorrect
  - Statement I is incorrect but Statement II is correct
65. In an *E. coli* strain *i* gene gets mutated and its product cannot bind the inducer molecule. If growth medium is provided with lactose, what will be the outcome?

- (a) Only *z* gene will get transcribed  
 (b) *z*, *y*, *a* genes will be transcribed  
 (c) *z*, *y*, *a* genes will not be translated  
 (d) RNA polymerase will bind the promoter region
66. Which of the following statements are true for spermatogenesis but do not hold true for oogenesis?  
 (A) It results in the formation of haploid gametes.  
 (B) Differentiation of gamete occurs after the completion of meiosis.  
 (C) Meiosis occurs continuously in a mitotically dividing stem cell population.  
 (D) It is controlled by the Luteinising Hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary.  
 (E) It is initiated at puberty.  
 Choose the most appropriate answer from the options given below:  
 (a) (C) and (E) only                      (b) (B) and (C) only  
 (c) (B), (D) and (E) only                (d) (B), (C) and (E) only
67. Under normal physiological conditions in human being every 100 mL of oxygenated blood can deliver \_\_\_\_\_ mL of O<sub>2</sub> to the tissues.  
 (a) 2 mL    (b) 5 mL  
 (c) 4 mL    (d) 10 mL
68. Nitrogenous waste is excreted in the form of pellet or paste by  
 (a) *Ornithorhynchus*                              (b) *Salamandra*  
 (c) *Hippocampus*                                (d) *Pavo*.
69. Which of the following functions is not performed by secretions from salivary glands ?  
 (a) Control bacterial population in mouth  
 (b) Digestion of complex carbohydrates  
 (c) Lubrication of oral cavity  
 (d) Digestion of disaccharides
70. Natural selection where more individual acquire specific character value other than the mean character value, leads to  
 (a) stabilising change                          (b) directional change  
 (c) disruptive change                            (d) random change.
71. If the length of a DNA molecule is 1.11 metres, what will be the approximate number of base pairs?  
 (a)  $3.3 \times 10^9$  bp                                (b)  $6.6 \times 10^9$  bp  
 (c)  $3.3 \times 10^6$  bp                                (d)  $6.6 \times 10^6$  bp
72. Which of the following is not a connective tissue?  
 (a) Blood    (b) Adipose tissue  
 (c) Cartilage                                        (d) Neuroglia
73. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason(R).  
**Assertion (A) :** All vertebrates are chordates but all chordates are not vertebrates.  
**Reason (R):** Notochord is replaced by vertebral column in the adult vertebrates.  
 In the light of the above statements, choose appropriate answer from the options given below.  
 (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)  
 (b) (A) is correct but (R) is not correct  
 (c) (A) is not correct but (R) is correct  
 (d) Both (A) and (R) are correct but (R) is incorrect explanation of (A)
74. In the taxonomic categories which hierarchical arrangement in ascending order is correct in case of animals ?  
 (a) Kingdom, Phylum, Class, Order, Family, Genus, Species  
 (b) Kingdom, Class, Phylum, Family, Order, Genus, Species  
 (c) Kingdom, Order, Class, Phylum, Family, Genus, Species  
 (d) Kingdom, Order, Phylum, Class, Family, Genus, Species
75. Identify the microorganism which is responsible for the production of an immunosuppressive molecule cyclosporin A.  
 (a) *Trichoderma polysporum*  
 (b) *Clostridium butylicum*  
 (c) *Aspergillus niger*  
 (d) *Streptococcus cerevisiae*
76. If '8' *Drosophila* in a laboratory population of '80' died during a week, the death rate in the population is \_\_\_\_\_ individuals per *Drosophila* per week.  
 (a) 0.1    (b) 10  
 (c) 1.0    (d) zero
77. Given below are two statements.  
**Statement I:** The coagulum is formed of network of threads called thrombins.  
**Statement II:** Spleen is the graveyard of erythrocytes.  
 In the light of the above statements, choose the most appropriate answer from the options given below.  
 (a) Both statement I and Statement II are correct  
 (b) Both Statement I and Statement II are incorrect  
 (c) Statement I is correct but Statement II is incorrect  
 (d) Statement I is incorrect but Statement II is correct
78. Which of the following is present between the adjacent bones of the vertebral column ?  
 (a) Intercalated discs                            (b) Cartilage  
 (c) Areolar tissue                                (d) Smooth muscle
79. Which of the following is not the function of conducting part of respiratory system?  
 (a) It clears inhaled air from foreign particles  
 (b) Inhaled air is humidified  
 (c) Temperature of inhaled air is brought to body temperature  
 (d) Provides surface for diffusion of O<sub>2</sub> and CO<sub>2</sub>
80. Lippe's loop is a type of contraceptive used as  
 (a) Cervical barrier                                (b) Vault barrier  
 (c) Non-Medicated IUD                        (d) Copper releasing IUD.
81. In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because  
 (a) retroviral vector is introduced into these lymphocytes.  
 (b) gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages

- (c) lymphocytes from patient's blood are grown in culture, outside the body  
 (d) genetically engineered lymphocytes are not immortal cells.
82. Detritivores breakdown detritus into smaller particles. This process is called  
 (a) catabolism (b) fragmentation  
 (c) humification (d) decomposition.
83. Given below are two statements:  
**Statement I:** Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.  
**Statement II:** Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site. In the light of the above statements, choose the most appropriate answer from the options given below:  
 (a) Both Statement I and Statement II are correct  
 (b) Both Statement I and Statement II are incorrect  
 (c) Statement I is correct but Statement II is incorrect  
 (d) Statement I is incorrect but Statement II is correct
84. At which stage of life the oogenesis process is initiated ?  
 (a) Puberty  
 (b) Embryonic development stage  
 (c) Birth  
 (d) Adult
85. Identify the asexual reproductive structure associated with *Penicillium*.  
 (a) Zoospores (b) Conidia  
 (c) Gemmules (d) Buds

### SECTION - B (ZOOLOGY)

Attempt any 10 questions out of 15

86. Which of the following is not a desirable feature of a cloning vector?  
 (a) Presence of origin of replication  
 (b) Presence of a marker gene  
 (c) Presence of single restriction enzyme site  
 (d) Presence of two or more recognition sites
87. The recombination frequency between the genes  $a$  and  $c$  is 5%,  $b$  and  $c$  is 15%,  $b$  and  $d$  is 9%,  $a$  and  $b$  is 20%,  $c$  and  $d$  is 24% and  $a$  and  $d$  is 29%. What will be the sequence of these genes on a linear chromosome ?  
 (a)  $a, d, b, c$  (b)  $d, b, a, c$   
 (c)  $a, b, c, d$  (d)  $a, c, b, d$
88. Match list-I with list-II.  

List-I (Biological molecules)	List-II (Biological functions)
(A) Glycogen	(i) Hormone
(B) Globulin	(ii) Biocatalyst
(C) Steroids	(iii) Antibody
(D) Thrombin	(iv) Storage product

 Choose the correct answer from the options given below :  
 (a) (A)-(iii), (B)-(ii), (C)-(iv), (D)-(i)  
 (b) (A)-(iv), (B)-(ii), (C)-(i), (D)-(iii)  
 (c) (A)-(ii), (B)-(iv), (C)-(iii), (D)-(i)  
 (d) (A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)
89. Select the incorrect statement regarding synapses.  
 (a) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.  
 (b) Electrical current can flow directly from one neuron into the other across the electrical synapse.  
 (c) Chemical synapses use neurotransmitters.  
 (d) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.
90. Which one of the following statements is correct ?  
 (a) The atrio-ventricular node (AVN) generates an action potential to stimulate atrial contraction  
 (b) The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria  
 (c) Blood moves freely from atrium to the ventricle during joint diastole.  
 (d) Increased ventricular pressure causes closing of the semilunar valves.
91. Match list-I with list-II.  

List-I	List-II
(A) Bronchioles	(i) Dense regular connective tissue
(B) Goblet cell	(ii) Loose connective tissue
(C) Tendons	(iii) Glandular tissue
(D) Adipose Tissue	(iv) Ciliated epithelium

 Choose the correct answer from the option given below.  
 (a) (A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)  
 (b) (A)-(i), (B)-(ii), (C)-(iii), (D)-(iv)  
 (c) (A)-(ii), (B)-(i), (C)-(iv), (D)-(iii)  
 (d) (A)-(iii), (B)-(iv), (C)-(ii), (D)-(i)
92. Which of the following statements is not true?  
 (a) Analogous structures are a result of convergent evolution.  
 (b) Sweet potato and potato is an example of analogy.  
 (c) Homology indicates common ancestry.  
 (d) Flippers of penguins and dolphins are a pair of homologous organs.
93. Which of the following is a correct statement?  
 (a) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.  
 (b) Bacteria are exclusively heterotrophic organisms.  
 (c) Slime moulds are saprophytic organisms classified under Kingdom Monera.  
 (d) Mycoplasma have DNA, ribosome and cell wall.
94. Match list-I with list-II with respect to method of contraception and their respective actions.  

List-I	List-II
(A) Diaphragms	(i) Inhibit ovulation and implantation
(B) Contraceptive pills	(ii) Increase phagocytosis of sperm within uterus
(C) Intra Uterine devices	(iii) Absence of menstrual cycle and ovulation following parturition
(D) Lactational amenorrhoea	(iv) They cover the cervix blocking the entry of sperms

Choose the correct answer from the options given below:

- (a) (A)-(iv), (B)-(i), (C)-(iii), (D)-(ii)  
 (b) (A)-(iv), (B)-(i), (C)-(ii), (D)-(iii)  
 (c) (A)-(ii), (B)-(iv), (C)-(i), (D)-(iii)  
 (d) (A)-(iii), (B)-(ii), (C)-(i), (D)-(iv)

95. Ten *E. coli* cells with  $^{15}\text{N}$ -dsDNA are incubated in medium containing  $^{14}\text{N}$  nucleotide. After 60 minutes, how many *E. coli* cells will have DNA totally free from  $^{15}\text{N}$ ?  
 (a) 20 cells (b) 40 cells  
 (c) 60 cells (d) 80 cells
96. Select the incorrect statement with respect to acquired immunity.  
 (a) Primary response is produced when our body encounters a pathogen for the first time.  
 (b) Anamnestic response is elicited on subsequent encounters with the same pathogen.  
 (c) Anamnestic response is due to memory of first encounter.  
 (d) Acquired immunity is non-specific type of defense present at the time of birth.
97. Statements related to human insulin are given below. Which statement(s) is/are correct about genetically engineered insulin?  
 (A) Pro-hormone insulin contain extra stretch of C-peptide  
 (B) A-peptide and B-peptide chains of insulin were produced separately in *E. coli*, extracted and combined by creating disulphide bond between them.  
 (C) Insulin used for treating diabetes was extracted from cattle and pigs.  
 (D) Pro-hormone insulin needs to be processed for converting into a mature and functional hormone.  
 (E) Some patients develop allergic reactions to the foreign insulin.

Choose the most appropriate answer from the options given below.

- (a) (A), (B) and (D) only (b) (B) only  
 (c) (C) and (D) only (d) (C), (D) and (E) only

98. If a colourblind female marries a man whose mother was also colourblind, what are the chances of her progeny having colour blindness?  
 (a) 25% (b) 50% (c) 75% (d) 100%
99. Which of the following are not the effects of parathyroid hormone?  
 (A) Stimulates the process of bone resorption  
 (B) Decreases  $\text{Ca}^{2+}$  level in blood  
 (C) Reabsorption of  $\text{Ca}^{2+}$  by renal tubules  
 (D) Decreases the absorption of  $\text{Ca}^{2+}$  from digested food  
 (E) Increases metabolism of carbohydrates
- Choose the most appropriate answer from the options given below.  
 (a) (A) and (C) only (b) (B), (D) and (E) only  
 (c) (A) and (E) only (d) (B) and (C) only

100. Given below are two statements.

**Statement I :** In a scrubber the exhaust from the thermal plant is passed through the electric wires to charge the dust particles.

**Statement II :** Particulate matter (PM 2.5) cannot be removed by scrubber but can be removed by an electrostatic precipitator.

In the light of the above statements, choose the most appropriate answer from the options given below.

- (a) Both Statement I and Statement II are correct  
 (b) Both Statement I and Statement II are incorrect  
 (c) Statement I is correct but Statement II is incorrect  
 (d) Statement I is incorrect but Statement II is correct

## HINTS & SOLUTIONS

1. (a) : Ribosome is responsible for synthesising proteins. The ribosome consists of structural RNAs and about 80 different proteins. In its inactive state, it exists as two subunits; large subunit and a small subunit when the small subunit encounters mRNA, the process of translation of the mRNA to protein begins.
2. (c) : Electrostatic precipitator is most widely used way to remove particulate matter. It can remove over 99 percent particulate matter present in the exhaust from a thermal power plant.
3. (b) : *Ulothrix* is a member of chlorophyceae. The stored food material in *Ulothrix* is starch. Mannitol is stored food material for members of phaeophyceae.
4. (c) : Hydrocolloid carrageen is obtained from rhodophyceae alga *Chondrus crispus*.
5. (c) : In predation one species derives benefit while the other one is harmed. So, in this type of population interaction one species is positively impacted, whereas another one is negatively impacted.

6. (a) : In  $\text{C}_4$  plants, the primary  $\text{CO}_2$  acceptor is a 3-carbon molecule phosphoenol pyruvate (PEP) and is present in the mesophyll cells. The enzyme responsible for the fixation is PEP carboxylase or PEPcase. Mesophyll cells of  $\text{C}_4$  plants lack RuBisCO enzyme whereas bundle sheath cells are rich in an enzyme ribulose bisphosphate carboxylase-oxygenase (RuBisCO).
7. (b) : The microbe *Frankia* produces nitrogen fixing nodules on the roots of *Alnus*, i.e., non leguminous plant.
8. (c) : Polymorphism (variation at genetic level) arises due to mutation. Polymorphism in DNA sequence is the basis of genetic mapping of human genome as well as of DNA fingerprinting.
9. (d) : The ability of plants to follow different pathway in response to environment or phases of life to form different kinds of structures is called plasticity, e.g., heterophylly in cotton, coriander and buttercup.
10. (c,d) : In glycolysis, two molecules of ATP are consumed during two phosphorylation reactions to form fructose 1, 6-bisphosphate. In return, four molecules of ATP are produced by substrate level phosphorylation (conversion of 1,





contained all the coding and non-coding sequence and later assigning different regions in the sequence with functions.

**51. (b) :** Osteoporosis is a disease characterised by low bone mass and loss of bone tissue that may lead to weak and fragile bones. Decreased levels of estrogen is a common cause for osteoporosis.

**52. (c) :** Maltose is a disaccharide made up two units of glucose with a chemical formula  $C_{12}H_{22}O_{11}$ .

**53. (d) :** The alimentary canal of birds have additional chambers, the crop and gizzard. Crop stores and softens the food however the gizzard helps in crushing and churning the food, e.g., *Pavo*, *Psittacula*, *Corvus*.

**54. (b)**

**55. (c) :** The endoplasmic reticulum, peroxisomes and mitochondria are bound by their own membranes and are only found in eukaryotic cells. So, SER and RER are not found in prokaryotic cells as they are exclusive to eukaryotic cells.

**56. (b) :** Meiosis II is similar to mitosis. However, there is no 'S' phase in meiosis II. DNA replication occurs during S-phase of interphase.

**57. (c) :** Breeding of crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called biofortification. It is the most practical aspect to improve the health of people and is undertaken for improved nutritional quality of the plants.

**58. (b) :** In cockroach, the first pair of wings called tegmina forewings comes out from the mesothorax.

**59. (a) :** Fatty acids and glycerol being insoluble, cannot be absorbed into the blood. They are first incorporated into small droplets called micelles which move into intestinal mucosa. They are re-formed into very small protein coated fat globules called chylomicrons which are transported to lacteals in the villi. Lacteals ultimately release absorbed substances into blood stream.

**60. (c) :** Formation of mature spermatozoa from spermatids is called spermiogenesis. Spermiation is the process by which mature spermatids are released from Sertoli cell into the seminiferous tubule lumen prior to their passage to the epididymis.

**61. (a) :** When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected - we save the entire forest to save the tiger. This approach is called *in situ* (on site) conservation. However, when there are situations where an animal or plant is endangered or threatened (organisms facing a very high risk of extinction in the wild in the near future) and needs urgent measures to save it from extinction, *ex situ* (off site) conservation is the desirable approach.

**62. (c) :** Mycoplasma are organisms that completely lack a cell wall. They are the smallest living cells that can penetrate a 0.2  $\mu\text{m}$  rated filter.

**63. (a) :** Arthritis is inflammation of joints. Tetany is a muscular disorder that causes rapid spasms in muscles, which occur due to less calcium in body fluid. Myasthenia gravis is an autoimmune disorder affecting neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle. Muscular dystrophy is the progressive degeneration of skeletal muscle mostly due to genetic disorder.

**64. (c) :** Rheumatoid arthritis (RA) is a result of auto-immune reaction. In RA, immune system mistakenly attacks healthy self cells in our body, causing inflammation, painful swelling in the affected parts of the body.

**65. (c) :** In *lac* operon, lactose is an inducer. It binds with repressor and inactivates it.

**66. (d) :** In both, spermatogenesis and oogenesis haploid gametes are formed. The spermatids are transformed into spermatozoa (sperms) by the process called spermiogenesis occurs in process spermatogenesis only. Spermatogenesis and oogenesis both are controlled by LH and FSH secreted by the anterior pituitary. Spermatogenesis is a continuous process that begins at puberty. Oogenesis on the other hand begins during embryonic development of the female.

**67. (b)**

**68. (d) :** *Pavo* belongs to Class Aves, so, excrete nitrogenous wastes as uric acid in the form of pellet or paste.

**69. (d)**

**70. (b)**

**71. (a) :** Length of DNA double helix = Total number of bp  $\times$  Distance between two consecutive bp

So, total number of bp =  $\frac{\text{Length of DNA double helix}}{\text{Distance between two consecutive bp}}$

$$= \frac{1.11 \text{ metres}}{0.34 \times 10^{-9} \text{ m/bp}} = 3.26 \times 10^9 \text{ bp}$$

Therefore, approximate number of base pair will be  $3.3 \times 10^9$  bp.

**72. (d) :** Neuroglia, also called glial cells which constitute the rest of neural system protect and support neurons.

**73. (a) :** The members of subphylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adult. Thus, all vertebrates are chordates but all chordates are not vertebrates.

**74. (None of the options is correct) :** Hierarchy of categories is the classification of organisms in a definite sequence of categories (taxonomic categories) in a descending order starting from Kingdom and reaching upto Species or an ascending order from Species to Kingdom. The number of similar characters of categories decreases from lowest rank (Species) to highest rank (Kingdom). The taxonomic hierarchy includes seven obligate categories—Kingdom, Division or Phylum, Class, Order, Family, Genus and Species.

**75. (a) :** Cyclosporin A is used as immuno-suppressant. This drug is derived from a fungus, *Trichoderma polysporum* and is used to prevent rejection of kidney, heart and liver transplants. Cyclosporin inhibits the activity of helper T-cells that acts against foreign bodies.

**76. (a) :** Death rate in the given population of *Drosophila* during given time interval is  $= \frac{8}{80} = 0.1$

**77. (d) :** Clot or coagulum is formed mainly of network of threads called fibrins in which dead and damaged formed elements of blood are trapped.

**78. (b) :** Cartilage is present in the tip of nose, outer ear joints, between adjacent bones of the vertebral column, limbs and hands in adults.

79. (d) : Exchange or respiratory part of respiratory system is the site of actual diffusion of  $O_2$  and  $CO_2$  between blood and atmospheric air.

80. (c)

81. (d) : In gene therapy for ADA deficiency, lymphocytes from patient's blood are grown in culture outside the body. A functional ADA cDNA is then introduced into these lymphocytes, which are subsequently returned to patient. As these cells are not immortal, thus patient requires periodic infusion of genetically engineered lymphocytes.

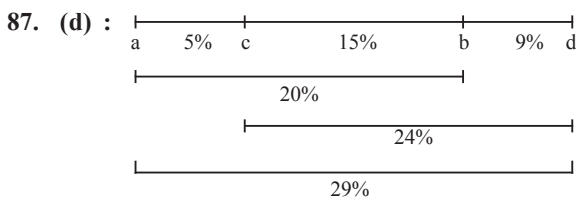
82. (b)

83. (a)

84. (b) : Oogenesis is initiated during embryonic development stage when a couple of million oogonia are formed within each fetal ovary. No oogonia are formed or added after birth.

85. (b)

86. (d) : In order to link alien DNA, the vector needs to have preferable single recognition site for commonly used restriction enzyme. Presence of more than one recognition sites within vector will generate several fragments and will complicate the gene cloning.



88. (d)

89. (d) : Impulse transmission across an electrical synapse is always faster than across chemical synapse.

90. (c) : Sinoatrial node (SAN) generates action potential to stimulate atrial contraction. Bicuspid and tricuspid valves open due to pressure exerted by blood present in atria and decrease

in pressure in ventricles during ventricular diastole. Decrease in ventricular pressure, during ventricular diastole closes semilunar valves to produce dub heart sound.

91. (a) : Bronchioles – Ciliated epithelium

Goblet cell – Glandular tissue

Tendons – Dense regular connective tissue

Adipose tissue – Loose connective tissue

92. (d) : Flippers of penguins and dolphins are pair of analogous organs.

93. (a) : Some of bacteria are autotrophic and vast majority are heterotrophic. Slime moulds are classified under Kingdom Protista. Mycoplasma completely lack a cell wall.

94. (b)

95. (c) : *E. coli* divides in 20 minutes. After 60 minutes generation III would have 75% DNA completely free from  $^{15}N$  and 25% of DNA would be hybrid ( $^{14}N/^{15}N$ ). So, out of 80 cells formed, 60 cells will be free from  $^{15}N$  DNA.

96. (d) : Acquired immunity is specific to pathogen. Innate immunity is non-specific type of defense present at the time of birth.

97. (b)

98. (d) : If a colourblind female ( $X^cX^c$ ) marries a man whose mother is colourblind, ( $X^cY$ ), then

$\begin{matrix} \sigma \\ \phi \end{matrix}$	$X^c$	$Y$
$X^c$	$X^cX^c$	$X^cY$
$X^c$	$X^cX^c$	$X^cY$

All offspring would be colourblind.

99. (b) : Parathyroid hormone (PTH) increases  $Ca^{2+}$  levels in the blood. It increases  $Ca^{2+}$  absorption from digested food. Thyroid hormones control metabolism of carbohydrates.

100. (b)

