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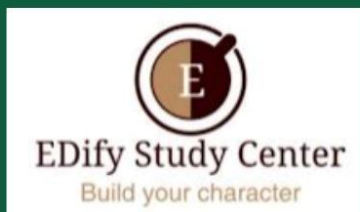
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PREVIOUS YEAR's QUESTIONS

NEET 2022

BIOLOGY (SOLVED)

1. Which of the following is not observed during apoplastic pathway ?
- (1) Apoplast is continuous and does not provide any barrier to water movement
 - (2) Movement of water occurs through intercellular spaces and wall of the cells
 - (3) The movement does not involve crossing of cell membrane
 - (4) The movement is aided by cytoplasmic streaming

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2. The device which can remove particulate matter present in the exhaust from a thermal power plant is :

- (1) Catalytic Converter
- (2) STP
- (3) Incinerator
- (4) Electrostatic Precipitator

3. Which one of the following never occurs during mitotic cell division?

- (1) Coiling and condensation of the chromatids
- (2) Spindle fibres attach to kinetochores of chromosomes
- (3) Movement of centrioles towards opposite poles
- (4) Pairing of homologous chromosomes

4. Hydrocolloid carrageen is obtained from:

- (1) Phaeophyceae only
- (2) Chlorophyceae and Phaeophyceae
- (3) Phaeophyceae and Rhodophyceae
- (4) Rhodophyceae only

5. 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 :

- (1) (a), (c), (d) and (e) Only
- (2) (a), (b) and (d) Only
- (3) (b), (c), (d) and (e) Only
- (4) (a), (b), (c) and (d) Only

6. DNA polymorphism forms the basis of :

- (1) Translation
- (2) Genetic mapping
- (3) DNA finger printing
- (4) Both genetic mapping and DNA finger printing

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

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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 :

- (1) (A) is not correct but (R) is correct
- (2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (4) (A) is correct but (R) is not correct

8. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes :

- (1) Terminalization
- (2) Synaptonemal complex
- (3) Bivalent
- (4) Sites at which crossing over occurs

9. The flowers are Zygomorphic in:

- (a) Mustard
- (b) Gulmohar
- (c) Cassia
- (d) Datura
- (e) Chilly

Choose the correct answer from the options given below:

- (1) (c), (d), (e) Only
- (2) (a), (b), (c) Only
- (3) (b), (c) Only
- (4) (d), (e) Only

10. 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 :

- (1) Cytokinin
- (2) ABA
- (3) Gibberellin
- (4) Ethylene

11. Which one of the following statement is not true regarding gel electrophoresis technique?

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(1) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.

(2) The process of extraction of separated DNA strands from gel is called elution.

(3) The separated DNA fragments are stained by using ethidium bromide.

(4) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

12. In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to :

(a) secretion of secondary metabolites and their deposition in the lumen of vessels.

(b) deposition of organic compounds like tannins and resins in the central layers of stem.

(c) deposition of suberin and aromatic substances in the outer layer of stem.

(d) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.

(e) presence of parenchyma cells, functionally active xylem elements and essential oils.

Choose the correct answer from the options given below:

(1) (b) and (d) Only

(2) (a) and (b) Only

(3) (c) and (d) Only

(4) (d) and (e) Only

13. Which of the following is incorrectly matched?

(1) Volvox – Starch

(2) Ectocarpus – Fucoxanthin

(3) Ulothrix – Mannitol

(4) Porphyra – Floridian Starch

14. Which one of the following plants does not show plasticity?

(1) Maize

(2) Cotton

(3) Coriander

(4) Buttercup

15. Read the following statements and choose the set of 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 options given below :

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- (1) (a), (c), (e) Only
- (2) (b), (d), (e) Only
- (3) (a), (c), (d) Only
- (4) (b), (e) Only

16. Which one of the following produces nitrogen fixing nodules on the roots of *Alnus*?

- (1) *Beijerinckia*
- (2) *Rhizobium*
- (3) *Frankia*
- (4) *Rhodospirillum*

17. Identify the incorrect statement related to Pollination :

- (1) Moths and butterflies are the most dominant pollinating agents among insects
- (2) Pollination by water is quite rare in flowering plants
- (3) Pollination by wind is more common amongst abiotic pollination
- (4) Flowers produce foul odours to attract flies and beetles to get pollinated

18. Which of the following is not a method of ex situ conservation?

- (1) Cryopreservation
- (2) In vitro fertilization
- (3) National Parks
- (4) Micropropagation

19. Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis? It involves:

- (1) Reduction of NADP to NADPH₂ on the stroma side of the membrane
- (2) Breakdown of proton gradient
- (3) Breakdown of electron gradient
- (4) Movement of protons across the membrane to the stroma

20. Which one of the following statements cannot be connected to Predation?

- (1) It is necessitated by nature to maintain the ecological balance
- (2) It helps in maintaining species diversity in a community
- (3) It might lead to extinction of a species
- (4) Both the interacting species are negatively impacted

21. 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

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

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

22. Given below are two statements :

Statement I : The primary CO₂ acceptor in C₄ plants is phosphoenolpyruvate and is found in the mesophyll cells.

Statement II : Mesophyll cells of C₄ plants lack RuBisCo enzyme. In the light of the above statements, choose the correct answer from the options given below:

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

23. 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 :

- (1) (a), (b), (d) and (e) Only
- (2) (b) and (c) Only
- (3) (a) and (d) Only
- (4) (b), (c), (d) and (e) Only

24. The gaseous plant growth regulator is used in plants to :

- (1) kill dicotyledonous weeds in the fields
- (2) speed up the malting process
- (3) promote root growth and root hair formation to increase the absorption surface
- (4) help overcome apical dominance

25. Which one of the following plants shows vexillary aestivation and diadelphous stamens?

- (1) Solanum nigrum

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- (2) Colchicum autumnale
- (3) Pisum sativum
- (4) Allium cepa

26. XO type of sex determination can be found in :

- (1) Monkeys
- (2) Drosophila
- (3) Birds
- (4) Grasshoppers

27. What amount of energy is released from glucose during lactic acid fermentation?

- (1) Less than 7%
- (2) Approximately 15%
- (3) More than 18%
- (4) About 10%

28. 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:

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

29. What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid?

- (1) Eight
- (2) Four
- (3) Six
- (4) Two

30. Match List-I with List-II

- | List-I | List-II |
|---------------|--|
| (a) Manganese | (i) Activates the enzyme catalase |
| (b) Magnesium | (ii) Required for pollen germination |
| (c) Boron | (iii) Activates enzymes of respiration |
| (d) Iron | (iv) Functions in splitting of water during photosynthesis |

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Choose the correct answer from the options given below :

- (1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
- (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
- (4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

31. Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for:

- (1) Natality
- (2) Population explosion
- (3) Competition
- (4) Biodiversity loss

32. The process of translation of mRNA to proteins begins as soon as :

- (1) The tRNA is activated and the larger subunit of ribosome encounters mRNA
- (2) The small subunit of ribosome encounters mRNA
- (3) The larger subunit of ribosome encounters mRNA
- (4) Both the subunits join together to bind with mRNA

33. "Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which:

- (1) osmosis is observed
- (2) water is transported
- (3) food is transported
- (4) for both water and food transportation

34. Exoskeleton of arthropods is composed of :

- (1) Glucosamine
- (2) Cutin
- (3) Cellulose
- (4) Chitin

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 :

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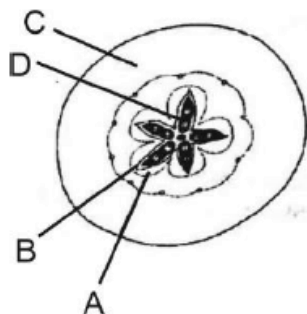
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- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

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



- (1) D → Seed
- (2) A → Mesocarp
- (3) B → Endocarp
- (4) C → Thalamus

37. Addition of more solutes in a given solution will :

- (1) not affect the water potential at all
- (2) raise its water potential
- (3) lower its water potential
- (4) make its water potential zero

38. The anatomy of springwood shows some peculiar features. Identify the correct set of statements about springwood.

- (a) It is also called as the earlywood
- (b) In spring season cambium produces xylem elements with narrow vessels
- (c) It is lighter in colour
- (d) The springwood along with autumnwood shows alternate concentric rings forming annual rings
- (e) It has lower density

Choose the correct answer from the options given below :

- (1) (c), (d) and (e) Only
- (2) (a), (b), (d) and (e) Only
- (3) (a), (c), (d) and (e) Only
- (4) (a), (b) and (d) Onl

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

- (1) Rain fall and storms
- (2) Burning of fossil fuels
- (3) Volcanic activity
- (4) Weathering of rocks

40. 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?

- (1) It cannot be adulterated like diesel
- (2) CNG burns more efficiently than diesel
- (3) The same diesel engine is used in CNG buses making the cost of conversion low
- (4) It is cheaper than diesel

41. What is the role of large bundle sheath cells found around the vascular bundles in C₄ plants?

- (1) To protect the vascular tissue from high light intensity
- (2) To provide the site for photorespiratory pathway
- (3) To increase the number of chloroplast for the operation of Calvin cycle
- (4) To enable the plant to tolerate high temperature

42. Which of the following occurs due to the presence of autosome linked dominant trait ?

- (1) Thalessemia
- (2) Sickle cell anaemia
- (3) Myotonic dystrophy
- (4) Haemophilia

43. Read the following statements on lipids and find out correct set of statements:

- (a) Lecithin found in the plasma membrane is a glycolipid
- (b) Saturated fatty acids possess one or more c = c bonds
- (c) Gingely 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 option given below:

- (1) (a), (b) and (d) only
- (2) (a), (b) and (c) only
- (3) (a), (d) and (e) only
- (4) (c), (d) and (e) only

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44. 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 :

- (1) Bioinformatics
- (2) Sequence annotation
- (3) Gene mapping
- (4) Expressed sequence tags

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

- (1) 5'GTATTC3'; 3'CATAAG5'
- (2) 5'GATACT3'; 3'CTATGA5'
- (3) 5'GAATTC3'; 3'CTTAAG5'
- (4) 5'CTCAGT3'; 3'GAGTCA5'

46. Match the plant with the kind of life cycle it exhibits:

List-I

List-II

- | | |
|---------------|---|
| (a) Spirogyra | (i) Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte |
| (b) Fern | (ii) Dominant haploid free-living gametophyte |
| (c) Funaria | (iii) Dominant diploid sporophyte alternating with reduced gametophyte called prothallus |
| (d) Cycas | (iv) Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte |

Choose the correct answer from the options given below :

- (1) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
- (2) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
- (3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

47. 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 ?

- (1) Competition
- (2) Predation
- (3) Amensalism
- (4) Commensalism

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

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- (1) Gene sequencing
- (2) Polymerase Chain Reaction
- (3) Gene Silencing
- (4) Autoradiography

49. 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 arms |
| (b) Acrocentric chromosome | (ii) Centromere at the terminal end |
| (c) Submetacentric | (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 :

- (1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (2) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (3) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
- (4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

50. 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:

- (1) (A) is not correct but (R) is correct
- (2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (4) (A) is correct but (R) is not correct

Zoology

51. Which of the following statements with respect to Endoplasmic Reticulum is incorrect?

- (1) SER are the sites for lipid synthesis
- (2) RER has ribosomes attached to ER

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- (3) SER is devoid of ribosomes
- (4) In prokaryotes only RER are present

52. Regarding Meiosis, which of the statements is incorrect?

- (1) Four haploid cells are formed at the end of Meiosis-II
- (2) There are two stages in Meiosis, Meiosis-I and II
- (3) DNA replication occurs in S phase of Meiosis-II
- (4) Pairing of homologous chromosomes and recombination occurs in Meiosis-I

53. 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 :

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

54. 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:

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

55. Identify the asexual reproductive structure associated with Penicillium :

- (1) Buds
- (2) Zoospores
- (3) Conidia
- (4) Gemmules

56. Nitrogenous waste is excreted in the form of pellet or paste by :

- (1) Pavo
- (2) Ornithorhynchus

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- (3) Salamandra
- (4) Hippocampus

57. Which of the following is present between the adjacent bones of the vertebral column?

- (1) Smooth muscle
- (2) Intercalated discs
- (3) Cartilage
- (4) Areolar tissue

58. 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 the most appropriate answer from the option given below :

- (1) (A) is not correct but (R) is correct
- (2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (4) (A) is correct but (R) is not correct

59. Lippe's loop is a type of contraceptive used as:

- (1) Copper releasing IUD
- (2) Cervical barrier
- (3) Vault barrier
- (4) Non-Medicated IUD

60. At which stage of life the oogenesis process is initiated?

- (1) Adult
- (2) Puberty
- (3) Embryonic development stage
- (4) Birth

61. Which of the following is not a connective tissue?

- (1) Neuroglia
- (2) Blood
- (3) Adipose tissue
- (4) Cartilage

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62. 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 chance of fractures.

Reason (R): Common cause of osteoporosis is increased levels of estrogen.

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

- (1) (A) is not correct but (R) is correct
- (2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (4) (A) is correct but (R) is not correct

63. 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:

- (1) (b), (c) and (e) only
- (2) (c) and (e) only
- (3) (b) and (c) only
- (4) (b), (d) and (e) only

64. A dehydration reaction links two glucose molecules to product maltose. If the formula for glucose is $C_6H_{12}O_6$ then what is the formula for maltose?

- (1) $C_{12}H_{24}O_{11}$
- (2) $C_{12}H_{20}O_{10}$
- (3) $C_{12}H_{24}O_{12}$
- (4) $C_{12}H_{22}O_{11}$

65. Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called :

- (1) Bio-accumulation
- (2) Bio-magnification
- (3) Bio-remediation
- (4) Bio-fortification

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66. Identify the microorganism which is responsible for the production of an immunosuppressive molecule

cyclosporin A :

- (1) Streptococcus cerevisiae
- (2) Trichoderma polysporum
- (3) Clostridium butylicum
- (4) Aspergillus niger

67. Tegmina in cockroach, arises from

- (1) Prothorax and Mesothorax
- (2) Prothorax
- (3) Mesothorax
- (4) Metathorax

68. Detritivores breakdown detritus into smaller particles. This process is called:

- (1) Decomposition
- (2) Catabolism
- (3) Fragmentation
- (4) Humification

69. 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.

- (1) zero
- (2) 0.1
- (3) 10
- (4) 1.0

70. In which of the following animals, digestive tract has additional chambers like crop and gizzard?

- (1) Pavo, Psittacula, Corvus
- (2) Corvus, Columba, Chameleon
- (3) Bufo, Balaenoptera, Bangarus
- (4) Catla, Columba, Crocodilus

71. 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.

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

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

72. Which of the following functions is not performed by secretions from salivary glands?

- (1) Digestion of disaccharides
- (2) Control bacterial population in mouth
- (3) Digestion of complex carbohydrates
- (4) Lubrication of oral cavity

73. In-situ conservation refers to:

- (1) Conserve only extinct species
- (2) Protect and conserve the whole ecosystem
- (3) Conserve only high-risk species
- (4) Conserve only endangered species

74. In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because :

- (1) Genetically engineered lymphocytes are not immortal cells.
- (2) Retroviral vector is introduced into these lymphocytes.
- (3) Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages
- (4) Lymphocytes from patient's blood are grown in culture, outside the body.

75. 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

- (1) Statement I is incorrect but Statement II are correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

76. Which of the following is not the function of conducting part of respiratory system?

- (1) Provides surface for diffusion of O₂ and CO₂

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- (2) It clears inhaled air from foreign particles
- (3) Inhaled air is humidified
- (4) Temperature of inhaled air is brought to body temperature

77. In the taxonomic categories which hierarchical arrangement in ascending order is correct in case of animals?

- (1) Kingdom, Order, Phylum, Class, Family, Genus, Species
- (2) Kingdom, Phylum, Class, Order, Family, Genus, Species
- (3) Kingdom, Class, Phylum, Family, Order, Genus, Species
- (4) Kingdom, Order, Class, Phylum, Family, Genus, Species

78. Given below are two statements :

Statement I : Fatty acids and glycerols cannot be absorbed into the blood.

Statement II : Specialized 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:

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

79. 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:

- (1) Statement I is incorrect but Statement II is correct
- (2) Both Statement I and Statement II are correct
- (3) Both Statement I and Statement II are incorrect
- (4) Statement I is correct but Statement II is incorrect

80. In an E. Coli strain *i* gene gets mutated and its product can not bind the inducer molecule. If growth medium is provided with lactose, what will be the outcome?

- (1) RNA polymerase will bind the promoter region
- (2) Only *z* gene will get transcribed
- (3) *z*, *y*, *a* genes will be transcribed
- (4) *z*, *y*, *a* genes will not be translated

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81. Select the incorrect statement with reference to mitosis:

- (1) Splitting of centromere occurs at anaphase
- (2) All the chromosomes lie at the equator at metaphase
- (3) Spindle fibres attach to centromere of chromosomes
- (4) Chromosomes decondense at telophase

82. Which of the following is a correct match for disease and its symptoms?

- (1) Muscular dystrophy – An auto immune disorder causing progressive degeneration of skeletal muscle
- (2) Arthritis – Inflamed joints
- (3) Tetany – High Ca^{2+} level causing rapid spasms.
- (4) Myasthenia gravis – Genetic disorder resulting in weakening and paralysis of skeletal muscle

83. Natural selection where more individuals acquire specific character value other than the mean character value, leads to

- (1) Random change
- (2) Stabilising change
- (3) Directional change
- (4) Disruptive change

84. Under normal physiological conditions in human being every 100 ml of oxygenated blood can deliver _____ ml of O_2 to the tissues.

- (1) 10 ml
- (2) 2 ml
- (3) 5 ml
- (4) 4 ml

85. If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs?

- (1) 6.6×10^6 bp
- (2) 3.3×10^9 bp
- (3) 6.6×10^9 bp
- (4) 3.3×10^6 bp

86. Select the incorrect statement with respect to acquired immunity.

- (1) Acquired immunity is non-specific type of defense present at the time of birth.
- (2) Primary response is produced when our body encounters a pathogen for the first time.

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(3) Anamnestic response is elicited on subsequent encounters with the same pathogen.

(4) Anamnestic response is due to memory of first encounter.

87. 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 options given below:

(1) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

(2) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

(3) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

(4) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

88. The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome?

(1) a, c, b, d

(2) a, d, b, c

(3) d, b, a, c

(4) a, b, c, d

89. Which one of the following statements is correct?

(1) Increased ventricular pressure causes closing of the semilunar valves.

(2) The atrio-ventricular node (AVN) generates an action potential to stimulate atrial contraction

(3) The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria

(4) Blood moves freely from atrium to the ventricle during joint diastole.

90. 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 Cattles and Pigs.

(d) Pro-hormone Insulin needs to be processed for converting into a mature and functional hormone.

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(e) Some patients develop allergic reactions to the foreign insulin.
Choose the most appropriate answer from the options given below:

- (1) (c), (d) and (e) only
- (2) (a), (b) and (d) only
- (3) (b) only
- (4) (c) and (d) only

91. If a colour blind female marries a man whose mother was also colour blind, what are the chances of her progeny having colour blindness?

- (1) 100%
- (2) 25%
- (3) 50%
- (4) 75%

92. Which of the following are not the effects of Parathyroid hormone?

- (a) Stimulates the process of bone resorption
- (b) Decreases Ca^{2+} level in blood
- (c) Reabsorption of Ca^{2+} by renal tubules
- (d) Decreases the absorption of Ca^{2+} from digested food
- (e) Increases metabolism of carbohydrates

Choose the most appropriate answer from the options given below:

- (1) (b) and (c) only
- (2) (a) and (c) only
- (3) (b), (d) and (e) only
- (4) (a) and (e) only

93. Ten E.coli cells with ^{15}N - dsDNA are incubated in medium containing ^{14}N nucleotide. After 60 minutes, how many E.coli cells will have DNA totally free from ^{15}N ?

- (1) 80 cells
- (2) 20 cells
- (3) 40 cells
- (4) 60 cells

94. Select the incorrect statement regarding synapses :

- (1) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.
- (2) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.

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(3) Electrical current can flow directly from one neuron into the other across the electrical synapse.

(4) Chemical synapses use neurotransmitters

95. Given below are two statements:

Statements 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 :

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are correct

(3) Both Statement I and Statement II are incorrect

(4) Statement I is correct but Statement II is incorrect

96. Which of the following is not a desirable feature of a cloning vector?

(1) Presence of two or more recognition sites

(2) Presence of origin of replication

(3) Presence of a marker gene

(4) Presence of single restriction enzyme site

97. Which of the following statements is not true?

(1) Flippers of penguins and dolphins are a pair of homologous organs

(2) Analogous structures are a result of convergent evolution

(3) Sweet potato and potato is an example of analogy

(4) Homology indicates common ancestry

98. Match List-I with List-II with respect to methods of Contraception and their respective actions.

List-I

(a) Diaphragms

(b) Contraceptive Pills

(c) Intra Uterine Devices

(d) Lactational Amenorrhea

List-II

(i) Inhibit ovulation and Implantation

(ii) Increase phagocytosis of sperm within Uterus

(iii) Absence of Menstrual cycle and ovulation following parturition

(iv) They cover the cervix blocking the entry of sperms

Choose the correct answer from the options given below:

(1) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

(2) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

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(3) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

(4) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

99. Match List-I with List-II

List-I

(Biological Molecules)

(a) Glycogen

(b) Globulin

(c) Steroids

(d) Thrombin

List-II

(Biological functions)

(i) Hormone

(ii) Biocatalyst

(iii) Antibody

(iv) Storage product

Choose the correct answer from the options given below:

(1) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

(2) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

(3) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)

(4) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)

100. Which of the following is a correct statement?

(1) Mycoplasma have DNA, ribosome and cell wall.

(2) Cyanobacteria are a group of autotrophic organisms classified under kingdom Monera.

(3) Bacteria are exclusively heterotrophic organisms.

(4) Slime moulds are saprophytic organisms classified under Kingdom Monera.

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Solutions

1(4) The movement is aided by cytoplasmic streaming

2 (4)

The device which can remove particulate matter present in the exhaust from a thermal power plant is Electrostatic Precipitator

3(4)

Homologous chromosomes are similar in gene position but may contain different alleles (different versions of the same gene). Offspring receives one homologous chromosome from the mother; the other is inherited from the father. The homologous chromosome pairs during prophase I of meiosis. This pairing is known as synapsis.

The maternal and paternal chromosomes cross over and exchange genetic material. Crossing over takes place between non-sister chromatids of homologous chromosomes. This leads to genetic recombination and thus variations and ultimately it leads to evolution.

4 (4)

Carrageenan is a polysaccharide obtained from the cell wall of *Codium* (Irish moss). It is used in the stabilization of emulsion in paints and cosmetics and in the alcohol and sugar industry. Hydrocolloid carrageenan is obtained from Rhodophyceae.

5(a)

Xylem and phloem are jointly situated along the same radius of vascular bundles as in stems and leaves. The conjoint vascular bundles usually have the phloem located only on the outer side of the xylem. Cambium is absent.

6(4)

Polymorphism in DNA sequence is basically variation at genetic level. It arises due to mutations.

So, polymorphism in DNA sequence is a process in which there are variations at various genetic levels, which occurs via sequencing in DNA.

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Some examples of polymorphism in DNA sequence are genetic mapping of human genome, DNA fingerprinting.

Hence, polymorphism in DNA sequence is a basis of genetic mapping of human genome, DNA fingerprinting.

7 (3)

Both statements are correct but the given reason is not the correct explanation.

The polymerase chain reaction is a method for making multiple copies of a specific DNA region.

Plasmids contain selectable marker genes that aid in separating the transformants or the cells in which the plasmid is present, from the non-transformants (those in which the plasmid is absent).

These selectable marker genes may provide resistance to antibiotics such as the ampicillin-resistant and the tetracycline-resistant sites seen in the plasmid pBR322

8 (4)

Prophase I in meiosis-I is divided into 5 subphases:

In Pachytene there is recombination of chromosomes. This is accomplished by the formation of recombination nodule.

There is chiasmata formation in Diplotene which depicts the past recombination event. Terminalisation takes place of chiasmata.

9 (3)

The zygomorphic flower is those which are only divided into two half from one plane. It includes pea, Gulmohar, cassia, and beans.

Mustard, datura, and chili are the actinomorphic flowers as they are divided into two half from any plane.

10 (4)

Ethylene is a simple gaseous plant growth regulator (PGR). It promotes Femaleness (Feminsing effect) in Pineapple (Bromeliaceae) and Cucumber. Application of Ethylene increases the number of female flowers in cucumber plants, thereby increasing the final yield. Hence, Ethylene can be applied by the farmer to increase the number of female flowers in the cucumber plants.

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11 (2) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

12 (2)

Xylem is a vascular tissue found in plants that participate in the transport of water and minerals from roots to different parts of the plants.

Depending on the stage of growth and origin; the xylem is classified as primary and secondary.

Secondary xylem grows from vascular cambium and is associated with lateral growth.

13 (3)

Ulothrix belongs to green algae and has starch as the reserve food.

Porphyra has Floridian starch as the reserve food as its red alga.

Volvox have chlorophyll-a, b and reserve food as starch. This is a Chlorophyceae member.

Fucoxanthin is found in brown algae Ectocarpus is a brown alga.

14 (1)

Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called plasticity. Example heterophylly in cotton, coriander and larkspur. In such plants, the leaves of the juvenile plant are different in shape from those in mature plants. Maize plants do not show plasticity

15 (3)

Statement a:

(a) Euchromatin is the loosely packed chromatin region. These are active during transcription.

(c) The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called a nucleosome

(d) Histones are rich in basic amino acid residues lysine and arginine.

16 (3)

Several bacteria produce small outgrowths (spherical) on the surface of legume roots, called as nodules. Rhizobium produces nitrogen fixing nodules in leguminous plants. But, Frankia also produces nitrogen-fixing nodules on the roots of non-leguminous plants (e.g. Alnus). Frankia is free-living in the soil, but can fix atmospheric nitrogen as symbionts.

17(1) Moths and butterflies are the most dominant pollinating agents among

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18 (3)

In-situ conservation means on-site conservation i.e. when we conserve and protect the whole ecosystem, its biodiversity at all levels is protected. For example, we save the entire forest to save the tiger.

Ex-situ conservation is an approach where threatened animals and plants are taken out from their natural habitat and placed in a special setting where they can be protected and given special care.

National parks are a type of in-situ conservation.

19 (3)

An electron transport chain (ETC) is a series of compounds that couples electron transfer with the transfer of protons across a membrane and transfer electrons from electron donors to electron acceptors with the help of redox reactions. This generates chemical energy in the form of adenosine triphosphate (ATP) by creating an electrochemical proton gradient, that drives ATP synthesis. The breakdown of proton gradient along the concentration gradient forms the ATP molecules.

F₀ protein complex of ATP synthase forms the channel through which protons cross the inner membrane during. For each ATP produced, 2H⁺ passes through F₀ from the intermembrane space to the matrix down the electrochemical proton gradient.

20(4) Both the interacting species are negatively impacted

21 (2)

Statement : Restriction endonucleases do recognise unique sequences to cut the DNA. These sequences are arranged in the form of a palindrome.

So, statement is correct.

Statement : Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site. This helps generate sticky ends.

22(2)

Phosphoenolpyruvate or PEP is the 3C compound and acts as the primary carbon dioxide acceptor in the mesophyll cells of C₄ plants, leading to the formation of OAA, C₄ acid. Ribulose-1,5-bisphosphate carboxylase oxygenase (RuBisCO) is an enzyme found in the mesophyll cells present within the C₃ plants. In C₄ plants, this enzyme is found in the bundle sheath cells.

23 (4)

Statement a: The leaflets are modified into pointed hard thorns in Citrus and Bougainvillea. This statement is incorrect as axillary buds of stems get modified into woody, straight and pointed thorns.

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Thorns are found in many plants such as Citrus and Bougainvillea. . They protect plants from browsing animals.

Statement b: Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin. This statement is correct.

Statement c: Stem is flattened and fleshy in Opuntia and modified to perform the function of leaves. This statement is correct.

Statement d: Rhizophora shows vertically upward growing roots that help to get oxygen for respiration. This statement is correct.

Statement e: Subaerially growing stems in grasses and strawberries help in vegetative propagation. This statement is correct.

24 (3) promote root growth and root hair formation to increase the absorption surface

25 (3)

Pisum commonly known as a pea is a genus of flowering plant belonging to family Fabaceae. In Fabaceae, the flowers are zygomorphic (bilateral symmetry), bisexual. The petals 5, polypetalous, the posterior outermost petal is large (the vexillum or standard), two lateral petals (the wings or alae) and the two anterior and innermost petals are united to form a boat-shaped structure (the keel or carina), descending imbricate or vexillary aestivation. Stamens are 10, diadelphous (stamens united by their filaments so as to form two groups). Placentation is marginal (placenta forms a rigid along ventral side and ovules are arranged in two vertical rows).

26(4) X/A ratio determines sex in Drosophila. ZW system in fowls. In the case of grasshoppers, sex is determined by XO system.

27 (1)

Lactic acid fermentation is a type of anaerobic metabolic process. This usually takes place in some bacteria and even in muscle cells of animals and human beings. In lactic acid fermentation NADH.H⁺ transfers its electrons directly to pyruvate, generating lactate as a by-product. Less than seven percent of the energy in glucose is released in this process.

28(3)

Decomposition is the process by which decomposers breakdown complex organic matter into inorganic substances.

The rate of decomposition is controlled by chemical composition of detritus and climatic factors.

Decomposition is slower if detritus is rich in lignin and chitin and quicker, if detritus is rich in nitrogen and water soluble substances like sugars.

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29 (4)

During glycolysis, total 4 ATPs are produced from one glucose molecule with a net gain of 2 ATPs.

30 (3)

List - I

- (a) Manganese
- (b) Magnesium
- (c) Boron
- (d) Iron

List - II

- (iv) Functions in splitting of water during photosynthesis
- (iii) Activates enzymes of respiration
- (ii) Required for pollen germination
- (i) Activates the enzyme catalase

31 (4)

Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for biodiversity loss.

32 (2) process of translation of mRNA to proteins begins as soon as the small subunit of ribosome encounters mRNA

33 (3) The girdling experiment shows that phloem is the tissue responsible for translocation of food; and that transport takes place in one direction i.e. towards the root.

34 (4) Arthropod bodies are supported by external bones or hardened exoskeleton which is made up of chitin.

It is produced by their skin which hardens to form a protective outer covering. The exoskeleton is a non-living substance that provides protection and prevents water loss from their body.

35(2)

Gregor J. Mendel, conducted hybridisation experiments on garden peas and selected 14 true breeding pea plant varieties (seven contrasting traits). Contrasting traits studied were smooth or wrinkled seeds, yellow or green seeds, inflated or constricted pods, green or yellow pods, tall or dwarf plants, violet or white flowers and axial or terminal flower positions.

Sl. No	Characteristic	Contrasting Traits
1	Flower color	violet/white
2	Flower position	axial/terminal
3	Seed color	yellow/green
4	Seed shape	round/wrinkled

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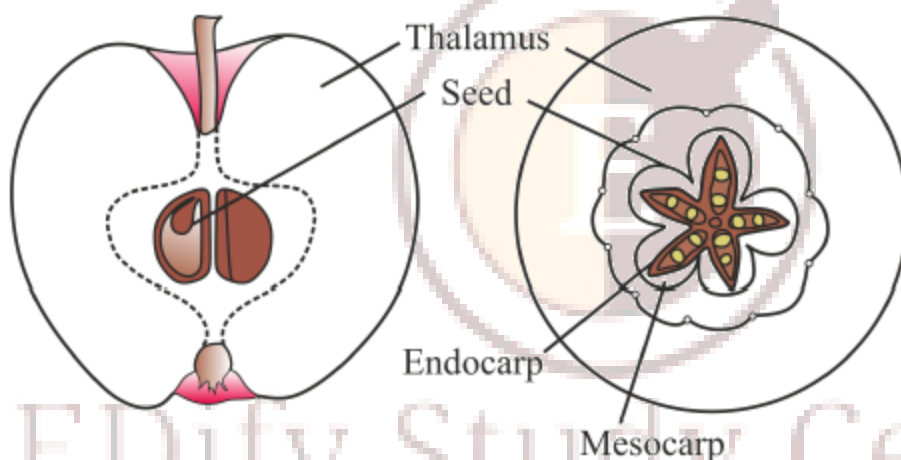
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5	Pod color	green/yellow
6	Pod shape	inflated/constricted
7	Stem height	tall/dwarf

36 (4)

The fruit is a characteristic feature of the flowering plants. It is a mature or ripened ovary, developed after fertilisation. If a fruit is formed without fertilisation of the ovary, it is called a parthenocarpic fruit.

In few species of plants, the thalamus also contributes to fruit formation, such fruits are called false fruits. The fleshy thalamus is edible in these cases. Example is Apple.



37 (3)

If some solute is dissolved in pure water, the solution has lower free water and the concentration of water decreases, reducing its water potential. The magnitude of this lowering due to dissolution of a solute is called solute potential.

38 (3)

The true statements are:

1. It is also called as the early wood.
2. In spring season cambium produces xylem elements with wider vessels.
3. Spring wood is lighter in colour
4. The spring wood along with autumn wood shows alternate concentric rings forming annual rings.
5. It has lower density

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39 (4) Weathering of rocks will accelerate phosphorus cycle

40(3) CNG is cheaper than petrol and it burns more efficiently unlike petrol or diesel. It also cannot be adulterated like diesel and petrol. The same diesel engine cannot be used in CNG buses for making the cost conversion low.

41 (3) The large cells around the vascular bundles of C_4 plants form bundle sheath. These cells have large number of chloroplasts to perform calvin cycle.

42 (3)

Thalassemia and sickle cell anaemia are autosomal recessive blood diseases.

Haemophilia is a sex-linked recessive disease.

Myotonic dystrophy is an autosomal dominant trait. Myotonic dystrophy is part of a group of inherited disorders called muscular dystrophies. It is the most common form of muscular dystrophy that begins in adulthood. Myotonic dystrophy is characterized by progressive muscle wasting and weakness.

43 (4)

statements (c), (d) and (e) are correct as oils have lower melting point and hence remain oil in winters. Lipids are generally insoluble in water but soluble in some organic solvents.

Lecithin is a type of phospholipid found in plasma membrane. Saturated fatty acids are without double bond.

44 (2)

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 Sequence annotation

45 (3)

A restriction enzyme (or restriction endonuclease) is an enzyme that cuts DNA at or near specific recognition nucleotide sequences known as restriction sites. Restriction enzymes recognize a specific sequence of nucleotides and produce a double-stranded cut in the DNA. Many of them are palindromic, meaning the base sequence reads the same backwards and forwards. Recognition sequences in DNA differ for each restriction enzyme, producing differences in the length, sequence and strand orientation (5' end or the 3' end) of a sticky-end of an enzyme restriction. If we cut the

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DNA with EcoR1, the DNA would be cut right in the middle. All the pieces would be the same size, which would be 15 kb long. Hence 5' GAATTC 3' ; 3' CTTAAG 5' palindrome sequence can be easily cut at about the middle by EcoR1 enzyme.

46(3)

List-I

- (a) Spirogyra
- (b) Fern
- (c) Funaria
- (d) Cycas

List-II

- (ii) Dominant haploid free-living gametophyte
- (iii) Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
- (iv) Dominant haploid leafy gametophyte alternating with Partially dependent multicellular sporophyte
- (i) Dominant diploid sporophyte vascular

47(2) In predation, one species is benefitted where as the other is harmed. It is (+ -) type of population interaction.

48 (3)

Transposons are a group of mobile genetic elements that are defined as a DNA sequence. Transposons can jump into different places of the genome; for this reason, they are called jumping genes. However, some transposons are always kept at the insertion site in the genome.

Transposons are a class of genetic elements that are also called the jumping genes which can be used during gene silencing.

49 (2)

In metacentric chromosome, centromere is in the middle of the chromosomes. Acrocentric chromosome has centromere close to the end of the chromosome. In submetacentric chromosome, centromere is slightly away from the middle of the chromosome. Telocentric chromosome has terminal centromere.

50(4)

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.

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Reason (R) : Closely located genes assort independently.

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

(1) (A) is not correct but (R) is correct

(2) Both (A) and (R) are correct and (R) is the correct explanation of (A)

51 (4)

The endoplasmic reticulum is present only in eukaryotic cells.

Prokaryotic cells like bacterial cells do not have the endoplasmic reticulum.

In eukaryotic cells, the endoplasmic reticulum is present in the form of a network of tiny tubular structures scattered throughout the cytoplasm.

The endoplasmic reticulum (ER) with ribosomes attached to its surface is referred to as the rough endoplasmic reticulum (RER) while the ER without ribosomes is called the smooth endoplasmic reticulum (SER).

The RER plays an important role in the synthesis and secretion of proteins.

The SER plays an important role in the synthesis of lipids

52 (3)

Meiosis involves two sequential cycles of nuclear and cell division called meiosis-I and meiosis-II but only single cycle of DNA replication.

The stage between two meiotic divisions is called interkinesis and is generally short lived and involves no DNA replication.

53 (1)

Blood coagulation or clotting is a mechanism to prevent excessive loss of blood. The clot or coagulum is a dark reddish brown scum formed at the site of an injury. It is formed mainly of a network of threads called fibrins in which dead and damaged formed elements of blood are trapped. Fibrins are formed by the conversion of inactive fibrinogens present in the plasma by the enzyme thrombin.

Erythrocytes or red blood cells are the most abundant of all the cells in blood. They have a red coloured, iron containing haemoglobin protein complex. RBCs have an average life span of 120 days after which they are destroyed in the spleen which is known as graveyard of RBCs.

54(2)

Restriction endonuclease inspects the entire length of the DNA.

Upon finding a specific nucleotide sequence it will bind to it on the DNA and will slice the sequence from the DNA strand.

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It recognizes palindrome nucleotide sequences (the sequence of base pairs reads the same on the two strands of DNA when the reading orientation is kept the same). They cut the DNA strand a little away from the centre of the palindrome nucleotide sequence but this occurs between the two same pairs on the opposite strands of DNA double helix.

This leaves single-stranded portions at the ends. There are overhanging stretches called sticky ends on each strand.

Sticky ends form hydrogen bonds with their complementary cut counterparts

55 (3) Penicillium reproduces through the formation of conidia. They are developed exogenously and are non-motile structures

56 (1)

birds (Pavo) excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water.

57 (3)

The joint between adjacent vertebrae is an example of cartilaginous joint. In this, bones involved are joined with the help of cartilage and it allows limited movement.

These are also called as amphiarthroses. These joints are neither fixed nor freely movable. Articulating bones are held together by hyaline or fibrocartilages.

58 (2)

Statement I: All vertebrates are chordates, but all chordates are not vertebrates.

This statement is true, in vertebrate notochord is replaced by a vertebral column. The notochord is present in the embryonic stage and the adult stage, it is replaced by a bony vertebral column. So, all vertebrates are chordates, but all chordates are not vertebrates

Statement II: A notochord is replaced by a vertebral column in adult vertebrates.

This statement is true, the notochord is a cartilaginous rod that is found in the embryonic stage in vertebrates, and later, it gets replaced by a bony vertebral column. That is why they are known as vertebrates.

59 (4)

the intrauterine device (IUD) presently available as the nonmedicated IUDs, is Lippe's loop.

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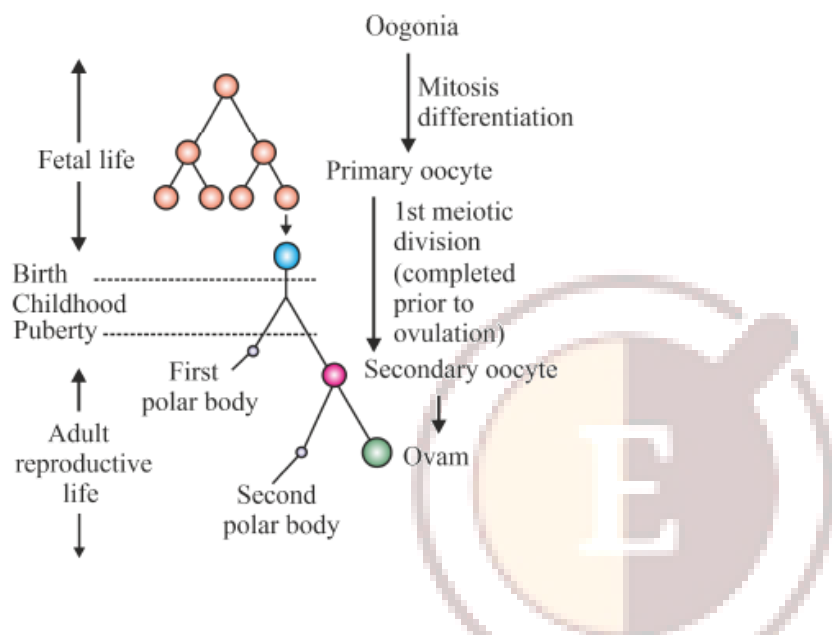
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60 (3)



61(1)

Connective tissues support and bind other tissues of the body together. Adipose tissue, cartilage, ligament are examples of connective tissues.

62 (4)

osteoporosis is due to decreased levels of oestrogen.

Osteoporosis is an age-related disorder characterised by decreased bone mass hence, the chances of fractures increase.

63 (1)

In both, spermatogenesis and oogenesis haploid gametes are formed. So (a) is true for both.

The spermatids are transformed into spermatozoa (sperms) by the process called spermiogenesis.

Hence, (b) is true for spermatogenesis only.

Spermatogenesis and oogenesis both are controlled by LH and FSH secreted by the anterior pituitary.

Hence (d) is true for both.

Spermatogenesis is a continuous process that begins at puberty. So (e) is true for spermatogenesis.

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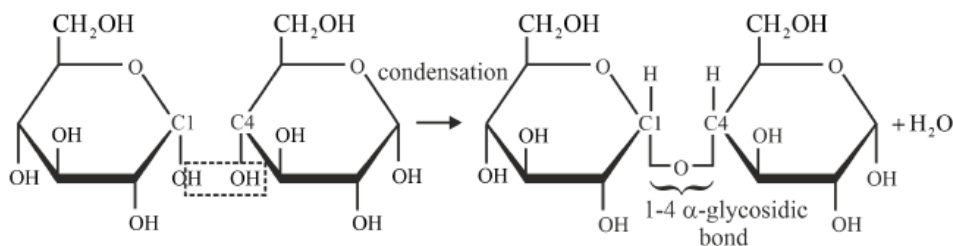
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Oogenesis on the other hand begins during embryonic development of the female.

64 (4)

Maltose is a common disaccharide that is formed by the dehydration reaction of two glucose molecules. The glycosidic bond present in maltose is α - 1,4 . During the formation, from two glucose molecules, one molecule of water is removed.

Thus, the formula of maltose becomes $C_{12}H_{22}O_{11}$



65(4)

Breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats is known as Biofortification.

Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.

Bioremediation is the phenomenon of using biological organism to handle pollution.

66 (2)

Bioactive molecule, cyclosporin A, that is used as an immunosuppressive agent in organ transplant patients, is produced by the fungus, *Trichoderma polysporum*.

67(3)

Two pairs of wings, forewings, and hindwings are present on the dorsal side. Forewings are the first pair of dark, opaque, thick, leathery wings that are protective in function. Hindwings are thin, broad, membranous, delicate, and transparent. These are attached to the tergum of the metathorax. These are helpful in flight and hence are also called true wings. Tegmina is the forewing of cockroaches and is called mesothoracic due to its origin.

68 (3)

Decomposition is the process of breaking of complex organic matter into simpler inorganic matter. There are five steps of decomposition. These are fragmentation, leaching, catabolism, humification and mineralization. Fragmentation is the process of breaking of detritus into small pieces by earthworm. Leaching is the process of

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releasing nutrients in the water and seeping into the soil. Catabolism is the process of breaking down of complex molecules into the simpler molecules. Humification is the process of formation of dark colored humus on the soil. Mineralization is the process of degradation of the humus to release inorganic nutrients.

69 (2)

Number of drosophila in laboratory = 80

Number of deaths of drosophila in a week = 8

Death rate of drosophila in a week = $8/80 = 0.1$

The death rate of drosophila per week is 0.1

70 (1)

Two additional chambers like crop and gizzard in alimentary canal are present in birds.

Pavo (Peacock), Psittacula (Parrot), Corvus (Crow) and Columba (Pigeon) are birds.

Option (1), (2) and (4) are incorrect because Catla is a bony fish, Crocodilus, Chameleon and Bangarus are reptiles, Bufo is an amphibian and Balaenoptera is an aquatic mammal.

71(3)

The process of spermatogenesis occurs in testis, in which the immature male germ cells or spermatogonia are converted to sperms. The spermatogonia present on the inside wall of seminiferous tubules undergoes mitosis. Some spermatogonia periodically undergo meiosis. These spermatogonia are called as primary spermatocytes (2n). A primary spermatocyte completes the first meiotic division and forms secondary spermatocytes (n). The secondary spermatocytes undergo the second meiotic division to produce spermatids.

The spermatids are then, transformed into spermatozoa or sperms by the process called spermiogenesis. After spermiogenesis, sperm heads become embedded in the Sertoli cells. These spermatozoa are finally released from the seminiferous tubules by the process called spermiation.

72 (1)

The saliva secreted by salivary glands has the following benefits:

It is rich in electrolytes like sodium ions, potassium ions, chloride ions, and bicarbonate ions.

It has an enzyme salivary amylase which acts on complex carbohydrates. Ex. starch by the action of salivary amylase (optimum pH 6.8) is converted into maltose.

It has lysozyme which has antibacterial properties and controls the bacterial population.

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The mucus in saliva lubricates the oral cavity

73(2)

When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected. This is in-situ or on site conservation strategy.

74(1)

In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because genetically engineered lymphocytes are not immortal cells and die after some time.

75(4)

Statement : Mycoplasma can pass through even micron filters which are smaller than micron.

So, the statement is correct.

Statement : Mycoplasma is a pleomorphic bacterium without a cell wall and hence it can easily change its shape, due to which it can pass through the filters easily.

So, statement is incorrect.

76(1)

External nostrils to terminal bronchioles are called the conducting part of the respiratory system.

- It serves the following functions
- Transports the air to alveoli.
- Clears foreign particles from the air.
- Humidifies the incoming air.
- Brings the air to body temperature.

Providing large surface area is not the function of the conducting part and is done by alveoli.

77 (2)

The hierarchical order of taxonomic categories is a sequence of categories in a decreasing or increasing order from kingdom to species and vice versa.

The kingdom has the highest rank followed by division, class, order, family, genus, and species. Species has the lowest rank in the hierarchy.

Kingdom: The topmost taxonomic category. Example: All animals are included in Kingdom Animalia. The unit in classification that denotes the grouping of organisms based on features which are observable is known as a taxon.

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Phylum: It is a term used for animals while its synonym division is used for plants. It is a collection of similar classes. Phylum Chordata of animals has class Mammalia along with birds, reptiles, and amphibians.

Class: One or more than one order makes a class. Class Mammalia includes all mammals which are bats, rodents, kangaroos, whales, great apes, and man.

Order: One or more than one similar families constitute an order.

Family: It is defined as a collection of similar genera. It can be separated from genera by reproductive and vegetative features. For example, cats and leopard are included in the same family.

Genus: It is defined as a group of similar species.

Species: Group of a population which is similar in form, shape and reproductive features so that fertile sibling can be produced.

Thus, the correct answer is 'Kingdom, phylum, class, order, family, genus, species.'

78 (2)

Statement I:

Fatty acids and glycerols cannot be absorbed into the blood. This is a correct statement. Since fats and glycerols are insoluble in water they are not absorbed directly in the blood.

Statement II:

Specialized lymphatic capillaries are called lacteals to carry chylomicrons into lymphatic vessels and ultimately into the blood. This is a correct statement.

Fatty acid and glycerols are converted into small droplets called micelles which are further converted into small protein-coated fat globules called chylomicrons. Chylomicrons are absorbed into lymphatic vessels first and from lymphatic vessels transported into the blood.

79(4)

autoimmune disorder is a condition where body defense mechanism recognises its own cells as foreign bodies. Sometimes, due to genetic and other unknown reasons, the body attacks self- cells.

Rheumatoid arthritis is an example where body attacks self cells (synovial membrane). So Statement I is correct but Statement II is incorrect.

80 (4)

As the product of 'i' gene binds with the operator region and blocks the transcription and translation of z, y and a genes.

It's product is prevented from binding to the operator by attaching it with the inducer. As the inducer can now no more capable of binding with the repressor, thus, in all the

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cases, operator always gets attached with the repressor thereby preventing the transcription and transmission of z, y and a.

Even in the presence of lactose, transcription and translation of z, y and a would not occur.

81 (3)

In mitosis, spindle fibers are attached to the centromere via the kinetochore. The kinetochore is a proteinaceous structure that helps in binding or holding the spindle fibers during cell division.

82 (2)

In tetanus, there are low calcium levels which cause muscle spasms.

Mysatheia gravis is an autoimmune disorder not a genetic disorder,

Muscular dystrophy is a genetic disorder and not an autoimmune disorder. Multiple sclerosis is an autoimmune disorder which also leads to weakening of skeletal muscles of the affected region.

Arthritis is caused due to inflammation of joints.

83(3)

If the organisms/individuals at one extreme of the distribution contribute more offspring to the next generation than other individuals do, then the mean of the population will change. This changes the normal distribution into one tailed-distribution.

This is the case of directional selection. If directional selection operates for many generations, an evolutionary trend within the population results.

84(3)

Haemoglobin is a red coloured iron containing pigment present in the RBCs. It binds to oxygen in a reversible manner to form oxyhaemoglobin. Each haemoglobin molecule can carry a maximum of four molecules of oxygen.

The amount of oxygen that binds to the hemoglobin within erythrocytes is primarily related to the oxygen tension which is expressed as the partial pressure of oxygen (pO_2). The relationship between the partial pressure of oxygen (pO_2) and percentage saturation of the hemoglobin with oxygen (O_2) is graphically represented by the oxygen hemoglobin dissociation curve which is sigmoidal under normal conditions.

Every 100 ml of oxygenated blood can deliver around 5 ml of O_2 to the tissues under normal physiological conditions.

85(2)

Length between the two base pairs=0.34nm

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The total length of the double helix of DNA = Total number of base pairs * Distance between the two base pairs.

Let us consider the total number of base pairs as X.

$$1.1\text{m} = X * 3.4 \times 10^{-10} \text{ m}$$

$$X = 3.3 \times 10^9 \text{ base pairs}$$

So, in a 1.1 m length of DNA, there will be about 3.3×10^9 base pairs.

86 (1)

Acquired immunity is a specific type of defense, which is not present at the time of birth.

Acquired immunity is resistance to a disease that an individual acquires during his lifetime.

It is pathogen-specific and is characterized by memory.

87 (2)

Ciliated epithelium is mainly present in the inner surface of hollow organs like bronchioles and fallopian tubes. The function is to move particles or mucus in a specific direction over the epithelium.

Some of the columnar or cuboidal cells get specialised for secretion and are called glandular epithelium.

Goblet cells are unicellular glands.

Tendons are dense regular connective tissues. They attach skeletal muscles to bones.

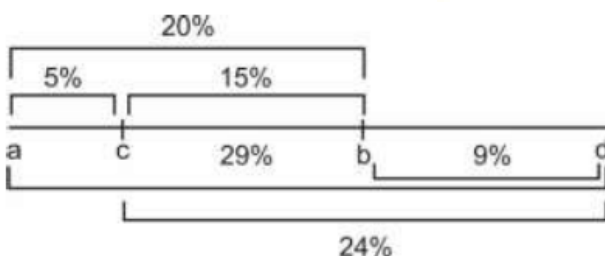
Adipose tissue is a type of loose connective tissue located mainly beneath the skin.

The cells of this tissue are specialised to store fats.

88 (1)

1% recombination frequency = 1 centi Morgan

To place the genes on a linear chromosome, decreasing order of recombination frequency will be considered.



89(4)

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during joint diastole, blood moves freely from atrium to ventricle as atrioventricular valve remain open during joint diastole.

90 (3)

In the year 1983, the American company Eli Lilly prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of *E. coli* to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin.

91 (1)

Colour blindness is an X-linked disorder. For colour blindness to be effective, all X chromosomes within an individual must be affected, and since men only have one X chromosome and women have two, the chances of men being impacted are exponentially higher.

However, in this case, the mother is colour-blind and hence she carries X^CX^C genotype. Father's mother is also colour-blind and hence even she will be having the genotype as X^CX^C, and she will be transferring her X^C chromosome to her son and hence, even the son will be colour-blind (X^CY). So, by this, we can tell all the X chromosomes are coding for colour-blind gene, and they inherit this gene to all their children, and hence, the chances of their child being colour-blind would be 100%.

	X ^C	X ^C
X ^C	X ^C X ^C	X ^C X ^C
Y	X ^C Y	X ^C Y

92(3)

PTH, also known as parathormone, is made by the parathyroid glands. PTH is directly involved in the functioning of bones, kidneys, and the small intestine.

- In the bones, PTH stimulates the release of calcium in an indirect process through osteoclasts which ultimately leads to resorption of the bones.
- Parathyroid hormone regulates calcium levels in the blood, largely by increasing the levels when they are too low.
- In the kidney, parathyroid hormone blocks the reabsorption of phosphate in the proximal tubule while promoting calcium

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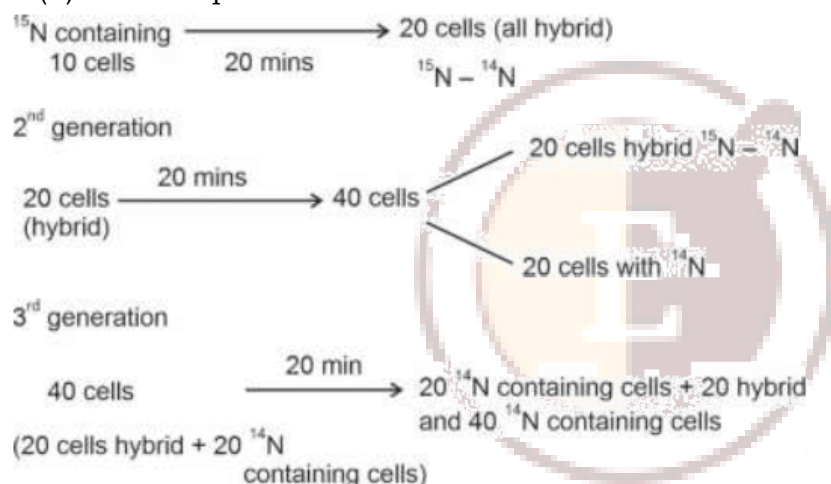
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- reabsorption in the ascending loop of Henle, distal tubule, and collecting tubule.
- PTH indirectly increases calcium absorption from food in the intestine, via its effects on vitamin D metabolism.
- PTH has no effect on carbohydrate metabolism.

93(4) From 10 parent E.coli cells



Therefore, after 60 minutes, 60 E.coli cells will have DNA totally free from ¹⁵N.

94 (1)

impulse transmission across an electrical synapse is always faster than that across a chemical synapse.

=> Chemical synapses use chemicals for transmission which are known as neurotransmitters.

=> The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.

=> In an electrical synapse, the transmission of the impulse occurs in the form of an electrical current from one neuron to the next neuron.

95 (1)

Scrubber is used by the industries which produce SO₂ as a by product.

The limestone present in slurry of scrubber remove SO₂ from the exhaust.

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Electrostatic precipitator is the most effective device to remove 99% of particulate matter, 'even PM 2.5' present in the exhaust.

96 (1)

The term cloning vectors refer to the DNA molecules that act as transporting vehicle which carries foreign DNA into a host cell for cloning and expression.

An ideal cloning vector should have the desired characteristics like small size (less than 10 kb), polylinker sequence, presence of selectable marker genes, and 'Ori' sequence.

The 'Ori' sequence, stands for origin of replication, is responsible for the initiation of replication process.

In order to link the foreign DNA, the vector needs to have very few, preferably single, recognition sites for the commonly used restriction enzymes. Presence of more than one recognition sites within the vector will generate several fragments, which will complicate the gene cloning process.

97(1)

Homologous organs are organs that are similar in structure and share a common ancestor. But functionally they are different.

Analogous organs are structurally different and similar in their function.

Explanation:

Flippers of penguins are dolphins that are examples of analogous organs.

Flippers in both help in swimming. So, they are functionally similar and hence analogous.

98 (3)

Diaphragm are dome-shaped rubber plastic covers that have to be fitted on the cervix in the female's vagina to check the entry of sperms into the uterus.

Oral pills are the hormonal tablets are taken orally. These pills contain a combination of synthetic hormones like progesterone and estrogen. These hormones inhibit ovulation and implantation by inhibiting the secretion of FSH and LH from the pituitary gland.

IUDs (Intrauterine Devices) are made of plastic, metal, or a combination of the two and are inserted into the uterus to prevent conception.

IUDs increase phagocytosis of sperms within the uterus and the hormone releasing IUDs make the uterus unsuitable for implantation and the cervix hostile to the sperms.

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Lactational amenorrhea is also a natural method of birth control where there is no menstrual cycle and therefore ovulation does not occur during intense lactation following parturition.

99 (1)

Glycogen is a polysaccharide and is a storage product in animals.

- Globulins form antibodies which are also known as immunoglobulins.
- Steroids form hormones like testosterone.
- Thrombin is a biocatalyst which converts soluble fibrinogen to insoluble fibrin.

100(2)

Slime moulds are classified under kingdom Protista.

Mycoplasma lack cell wall.

Bacteria can be autotrophic as well as heterotrophic.

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