NEET 2022 — Biology Question Paper with Solutions

97 Biology questions as set in the paper · answers checked by RankUp

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

(A) In vitro fertilization
(B) National Parks
(C) Micropropagation
(D) Cryopreservation

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2. 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

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3. 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

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4. Hydrocolloid carrageen is obtained from :

(A) Chlorophyceae and Phaeophyceae
(B) Phaeophyceae and Rhodophyceae
(C) Rhodophyceae only
(D) Phaeophyceae only

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

(A) Colchicum autumnale
(B) Pisum sativum
(C) Allium cepa
(D) Solanum nigrum

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6. Which of the following is incorrectly matched?

(A) Ectocarpus - Fucoxanthin
(B) Ulothrix - Mannitol
(C) Porphyra - Floridian Starch
(D) Volvox - Starch

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

(A) The small subunit of ribosome encounters mRNA
(B) The larger subunit of ribosome encounters mRNA
(C) Both the subunits join together to bind with mRNA
(D) The tRNA is activated and the larger subunit of ribosome encounters mRNA

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8. 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

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9. Given below are two statements:
Statement I : The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.
Statement II : Mesophyll cells of C_4 plants lack RuBisCo enzyme.
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

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10. 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 $NADPH_2$ on the stroma side of the membrane

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11. 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

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

(A) Four
(B) Six
(C) Two
(D) Eight

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

(A) Cotton
(B) Coriander
(C) Buttercup
(D) Maize

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14. DNA polymorphism forms the basis of:

(A) Genetic mapping
(B) DNA finger printing
(C) Both genetic mapping and DNA finger printing
(D) Translation

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

(A) Drosophila
(B) Birds
(C) Grasshoppers
(D) Monkeys

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16. 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

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

(A) speed up the malting process
(B) promote root growth and roothair formation to increase the absorption surface
(C) help overcome apical dominance
(D) kill dicotyledonous weeds in the fields

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18. Exoskeleton of arthropods is composed of:

(A) Cutin
(B) Cellulose
(C) Chitin
(D) Glucosamine

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19. 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 :

(A) (b), (d), (e) only
(B) (a), (c), (d) only
(C) (b), (e) only
(D) (a), (c), (e) only

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

(A) It helps in maintaining species diversity in a community
(B) It might lead to extinction of a species
(C) Both the integrating species are negatively impacted
(D) It is necessitated by nature to maintain the ecological balance

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21. The flowers are Zygomorphic in :

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

Choose the correct answer from the options given below :

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

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22. 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) (a), (b), (c), (d) and (e) only
(C) (a), (b), (c) and (d) only
(D) (a), (c), (d) and (e) only

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23. 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

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24. 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.

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25. 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

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26. 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%

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27. In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to :
(a) secretion of secondary metabolities 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 :

(A) (a) and (b) only
(B) (c) and (d) only
(C) (d) and (e) only
(D) (b) and (d) only

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

(A) Synaptonemal complex
(B) Bivalent
(C) Sites at which crossing over occurs
(D) Terminalization

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29. 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

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

(A) Polymerase Chain Reaction
(B) Gene Silencing
(C) Autoradiography
(D) Gene sequencing

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31. 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

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32. 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 :

(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)

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33. 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:

(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)

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

(A) Sickle cell anaemia
(B) Myotonic dystrophy
(C) Haemophilia
(D) Thalessemia

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35. 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

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

(A) 5'GATACT3' ; 3'CTATGA5'
(B) 5'GAATTC3' ; 3'CTTAAG5'
(C) 5'CTCAGT3' ; 3'GAGTCA5'
(D) 5'GTATTC3' ; 3'CATAAG5'

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37. 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 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

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38. 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

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39. 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

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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

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41. 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 autumn wood shows alternate concentric rings forming annual rings
(e) It has lower density
Choose the correct answer from the options given 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

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42. In-situ conservation refers to :

(A) Protect and conserve the whole ecosystem
(B) Conserve only high-risk species
(C) Conserve only endangered species
(D) Conserve only extinct species

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

(A) Corvus, Columba, Chameleon
(B) Bufo, Balaenoptera, Bangarus
(C) Catla, Columba, Crocodilus
(D) Pavo, Psittacula, Corvus

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

(A) 3.3×10^9 bp
(B) 6.6×10^9 bp
(C) 3.3×10^6 bp
(D) 6.6×10^6 bp

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45. 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 :

(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

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46. 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 (d) only
(B) (b) and (c) only
(C) (b), (d) and (e) only
(D) (b), (c) and (e) only

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47. 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:

(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

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48. 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

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

(A) Cervical barrier
(B) Vault barrier
(C) Non-Medicated IUD
(D) Copper releasing IUD

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

(A) 2 ml
(B) 5 ml
(C) 4 ml
(D) 10 ml

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51. 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:

(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

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

(A) Blood
(B) Adipose tissue
(C) Cartilage
(D) Neuroglia

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

(A) Ornithorhynchus
(B) Salamandra
(C) Hippocampus
(D) Pavo

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

(A) There are two stages in Meiosis, Meiosis-I and II
(B) DNA replication occurs in S phase of Meiosis-II
(C) Pairing of homologous chromosomes and recombination occurs in Meiosis-I
(D) Four haploid cells are formed at the end of Meiosis-II

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55. 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?

(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

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

(A) Arthritis - Inflammed joints
(B) Tetany - High Ca^{2+} level causing rapid spasms
(C) Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle
(D) Muscular dystrophy - An auto immune disorder causing progressive degeneration of skeletal muscle

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57. 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

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58. 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 :

(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

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59. 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

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60. 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?

(A) $C_{12}H_{20}O_{10}$
(B) $C_{12}H_{24}O_{12}$
(C) $C_{12}H_{22}O_{11}$
(D) $C_{12}H_{24}O_{11}$

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

(A) RER has ribosomes attached to ER
(B) SER is devoid of ribosomes
(C) Only RER are present in prokaryotes
(D) SER are the sites for lipid synthesis

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62. Tegmina in cockroach, arises from

(A) Prothorax
(B) Mesothorax
(C) Metathorax
(D) Prothorax and Mesothorax

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63. 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 :

(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

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64. 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

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

(A) Stabilising change
(B) Directional change
(C) Disruptive change
(D) Random change

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66. 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_2 and CO_2

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

(A) Puberty
(B) Embryonic development stage
(C) Birth
(D) Adult

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68. 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.

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69. Select the incorrect statement with reference to mitosis :

(A) All the chromosomes lie at the equator at metaphase
(B) Spindle fibres attach to centromere of chromosomes
(C) Chromosomes decondense at telophase
(D) Splitting of centromere occurs at anaphase

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

(A) Catabolism
(B) Fragmentation
(C) Humification
(D) Decomposition

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

(A) 25%
(B) 50%
(C) 75%
(D) 100%

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72. 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.

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73. Statements related to human Insulin are given below.
Which statements 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.
(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

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74. 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.

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75. 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)

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76. 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?

(A) 20 cells
(B) 40 cells
(C) 60 cells
(D) 80 cells

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77. 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?

(A) a, d, b, c
(B) d, b, a, c
(C) a, b, c, d
(D) a, c, b, d

NEET 2022

78. 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:

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

NEET 2022

79. 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

NEET 2022

80. 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

NEET 2022

81. 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.

NEET 2022

82. 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:

(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)

NEET 2022

83. Match List-I with List-II with respect to methods 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 Amenorrhea (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)

NEET 2022

84. 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.

NEET 2022

85. 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

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)

NEET 2022

86. "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

NEET 2022

87. 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

NEET 2022

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

(A) STP
(B) Incinerator
(C) Electrostatic Precipitator
(D) Catalytic Convertor

NEET 2022

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

(A) Rhizobium
(B) Frankia
(C) Rhodospirillum
(D) Beijerinckia

NEET 2022

90. 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

NEET 2022

91. 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 burns 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

NEET 2022

92. 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:

(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

NEET 2022

93. 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

NEET 2022

94. 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

NEET 2022

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

(A) Bio-magnification
(B) Bio-remediation
(C) Bio-fortification
(D) Bio-accumulation

NEET 2022

96. Identify the asexual reproductive structure associated with Penicillium :

(A) Zoospores
(B) Conidia
(C) Gemmules
(D) Buds

NEET 2022

97. 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

Answer key and explanations

1. Answer: (B) National Parks

National parks protect wildlife in its natural habitat, so they are an in situ method. In vitro fertilisation, micropropagation (tissue culture) and cryopreservation all keep or propagate organisms away from their natural habitat, which is ex situ conservation.

2. Answer: (C) (b), (c), (d) and (e) only

Tendrils of cucumber and pumpkin come from axillary buds, Opuntia has a flattened green phylloclade, Rhizophora has upward-growing pneumatophores for oxygen, and runners/stolons of grasses and strawberry spread vegetatively. Statement (a) is wrong because the thorns of Citrus and Bougainvillea are modified axillary buds (stem), not leaflets.

3. Answer: (C) Statement I is correct but Statement II is incorrect

Decomposition is the breakdown of detritus into simpler inorganic substances by decomposers, so Statement I is true. Detritus rich in lignin and chitin decomposes slowly; decomposition is faster when detritus is rich in nitrogen and water-soluble substances like sugars, so Statement II is false.

4. Answer: (C) Rhodophyceae only

Carrageen is a hydrocolloid obtained from red algae (Rhodophyceae), while algin comes from brown algae (Phaeophyceae). Including Phaeophyceae confuses carrageen with algin.

5. Answer: (B) Pisum sativum

Pisum sativum (pea, family Fabaceae) has vexillary (papilionaceous) aestivation and diadelphous stamens (9+1). Colchicum and Allium are monocots of Liliaceae with free tepals and epiphyllous stamens, and Solanum nigrum has valvate petals with epipetalous stamens.

6. Answer: (B) Ulothrix - Mannitol

Ulothrix is a green alga that stores starch, so pairing it with mannitol is wrong; mannitol and laminarin are reserve foods of brown algae. Ectocarpus (brown alga) has fucoxanthin, Porphyra (red alga) stores floridean starch, and Volvox (green alga) stores starch.

7. Answer: (A) The small subunit of ribosome encounters mRNA

The ribosome exists as separate large and small subunits in its inactive state, and translation of an mRNA begins when the small subunit encounters the mRNA. The large subunit joins only later, after the initiation complex has formed on the small subunit.

8. Answer: (C) Pairing of homologous chromosomes

Pairing (synapsis) of homologous chromosomes happens only in prophase I of meiosis and never in mitosis. Condensation of chromatids, movement of centrioles to the poles and attachment of spindle fibres to kinetochores are all normal events of mitosis.

9. Answer: (A) Both Statement I and Statement II are correct

In C_4 plants the primary CO_2 acceptor is phosphoenolpyruvate, carboxylated by PEP carboxylase in mesophyll cells. RuBisCO is absent from the mesophyll and is confined to bundle sheath cells, where the Calvin cycle runs, so both statements are correct.

10. Answer: (B) Breakdown of electron gradient

In chemiosmosis, ATP is made when the proton gradient across the thylakoid membrane breaks down as protons flow through CF_0 back to the stroma, and $NADP^+$ is reduced on the stroma side. There is no 'electron gradient' whose breakdown releases energy; the gradient is of protons, so that statement is the one that is not true.

11. Answer: (C) Biodiversity loss

Habitat loss and fragmentation, over-exploitation, alien species invasions and co-extinctions are the four major causes (the 'Evil Quartet') of biodiversity loss. They do not cause population explosion, and competition and natality are population attributes, not consequences of these threats.

12. Answer: (C) Two

In glycolysis 2 ATP are used and 4 ATP are formed by substrate-level phosphorylation, so the net gain is 2 ATP per glucose converted to two pyruvate (besides 2 NADH). Four is the gross yield, not the net gain.

13. Answer: (D) Maize

Heterophylly (different leaf forms in juvenile and mature plants or in different environments) is the textbook example of plasticity, seen in cotton, coriander, larkspur and buttercup. Maize is not cited as showing such plasticity.

14. Answer: (C) Both genetic mapping and DNA finger printing

Variation at the DNA level (DNA polymorphism, e.g. repetitive and VNTR sequences) is the basis of both genetic mapping of the human genome and DNA fingerprinting. Translation has nothing to do with polymorphism, and choosing only one technique leaves out the other.

15. Answer: (C) Grasshoppers

In grasshoppers males have only one X chromosome (XO) and females XX, which is XO-type sex determination. Drosophila and monkeys (mammals) have XY type, and birds have ZW type.

16. Answer: (B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

PCR is indeed used to amplify DNA, and the ampicillin-resistance gene is a selectable marker used to pick out transformed cells. Both statements are true, but the use of a selectable marker does not explain DNA amplification by PCR.

17. Answer: (B) promote root growth and roothair formation to increase the absorption surface

The gaseous plant growth regulator is ethylene, which promotes root growth and root-hair formation, increasing the absorbing surface. Speeding up malting is done by gibberellins, overcoming apical dominance by cytokinins, and killing dicot weeds by the auxin 2,4-D.

18. Answer: (C) Chitin

The exoskeleton of arthropods is made of chitin, a polysaccharide of N-acetylglucosamine units. Glucosamine is only the building unit, while cutin and cellulose are plant materials.

19. Answer: (B) (a), (c), (d) only

Euchromatin is loosely packed (a), the negatively charged DNA is wrapped around the positively charged histone octamer (c), and histones are rich in the basic amino acids lysine and arginine (d). Heterochromatin is densely packed and transcriptionally inactive, and a typical nucleosome contains about 200 bp of DNA, not 400 bp.

20. Answer: (C) Both the integrating species are negatively impacted

In predation the predator benefits and the prey is harmed (+/−), so it is wrong to say both interacting species are negatively affected; that describes competition. Predation does help maintain species diversity, keeps prey populations in check for ecological balance, and over-exploitation by predators can drive a prey species to extinction.

21. Answer: (B) (b), (c) only

Zygomorphic flowers can be divided into two similar halves in only one vertical plane, as in pea, gulmohur, bean and Cassia. Mustard, Datura and chilli have actinomorphic (radially symmetrical) flowers.

22. Answer: (B) (a), (b), (c), (d) and (e) only

All five statements are correct: roots have radial bundles with xylem and phloem on alternate radii; conjoint closed bundles (monocot stem) lack cambium; open bundles have cambium between xylem and phloem; dicot stems have endarch protoxylem; and monocot roots are usually polyarch with more than six xylem bundles.

23. Answer: (D) Moths and butterflies are the most dominant pollinating agents among insects

Among insects the dominant pollinating agents are bees, not moths and butterflies, so that statement is incorrect. Water pollination is indeed rare, wind is the commonest abiotic agent, and flowers such as Amorphophallus produce foul odours to attract flies and beetles.

24. Answer: (C) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

In gel electrophoresis DNA is stained with ethidium bromide and seen as bright orange bands under UV light, and cutting out and extracting the bands is called elution. A chromogenic substrate giving blue colour is used in blue-white screening of recombinant colonies (β-galactosidase), not to visualise DNA bands on a gel.

25. Answer: (C) Ethylene

Ethylene promotes female flowers in cucumber, which increases the number of fruits and hence the yield. Gibberellins tend to promote maleness, while ABA and cytokinin do not have this effect.

26. Answer: (D) Less than 7%

In fermentation glucose is only partially broken down, and less than 7% of the energy in glucose is released, part of which is trapped as ATP. Higher percentages wrongly suggest more complete oxidation, which happens only in aerobic respiration.

27. Answer: (A) (a) and (b) only

The dark, insect-resistant heartwood forms because organic compounds such as tannins, resins, oils, gums, aromatic substances and essential oils (secondary metabolites) are deposited in the central or innermost layers of the stem, filling the lumen of vessels. Deposition in the peripheral or outer layers describes the region of sapwood/bark, and heartwood contains dead, non-functional elements, not active xylem.

28. Answer: (C) Sites at which crossing over occurs

Recombination nodules appear on the synaptonemal complex in pachytene and mark the sites where crossing over between non-sister chromatids takes place. The synaptonemal complex itself and the bivalent form earlier (zygotene), and terminalisation occurs later in diakinesis.

29. Answer: (A) Both Statement I and Statement II are correct

Mendel studied seven pairs of contrasting traits in pea and from them proposed the laws of inheritance. The seven characters were seed shape, seed colour, flower colour, pod shape, pod colour, flower position and stem height, which is exactly the list in Statement II, so both are correct.

30. Answer: (B) Gene Silencing

In RNA interference (gene silencing) the complementary dsRNA that silences a specific mRNA can come from RNA viruses or from mobile genetic elements (transposons) that replicate via an RNA intermediate. Transposons are not used in PCR, autoradiography or sequencing.

31. Answer: (A) Predation

Predation benefits the predator (+) and harms the prey (−). Amensalism is 0/−, commensalism is +/0, and competition is −/− for both species.

32. Answer: (B) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

Spirogyra is haplontic with a dominant free-living haploid gametophyte; ferns have a dominant diploid sporophyte alternating with a small gametophyte, the prothallus; Funaria (moss) has a dominant leafy haploid gametophyte with a partially dependent sporophyte; and Cycas is a vascular plant with a dominant sporophyte and highly reduced gametophytes.

33. Answer: (A) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

A metacentric chromosome has a middle centromere with two equal arms; acrocentric has it very close to one end, giving one extremely short and one very long arm; submetacentric has it slightly away from the middle; and telocentric has a terminal centromere.

34. Answer: (B) Myotonic dystrophy

Myotonic dystrophy is an autosomal dominant Mendelian disorder. Sickle-cell anaemia and thalassemia are autosomal recessive, and haemophilia is X-linked recessive.

35. Answer: (C) Weathering of rocks

Rocks are the natural reservoir of phosphorus, and weathering of rocks releases phosphates into the soil, speeding up the phosphorus cycle. Unlike carbon, phosphorus has no significant gaseous phase, so burning fossil fuels and volcanic gases do not drive this cycle.

36. Answer: (B) 5'GAATTC3' ; 3'CTTAAG5'

A palindrome reads the same 5'→3' on both strands; 5'GAATTC3'/3'CTTAAG5' is such a sequence and is the recognition site of EcoRI. In the other pairs the bottom strand read 5'→3' is not the same as the top strand, so they are not palindromes.

37. Answer: (C) (c), (d) and (e) only

Gingelly oil has a low melting point and stays liquid in winter, lipids are insoluble in water but soluble in organic solvents, and a fatty acid esterified with glycerol forms a monoglyceride, so (c), (d) and (e) are correct. Lecithin is a phospholipid, not a glycolipid, and saturated fatty acids have no C=C double bonds.

38. Answer: (B) To increase the number of chloroplast for the operation of Calvin cycle

The large bundle sheath cells of C_4 plants (Kranz anatomy) contain many chloroplasts and are the site of the Calvin cycle, where CO_2 released from C_4 acids is fixed by RuBisCO. They do not support photorespiration; C_4 plants largely avoid photorespiration.

39. Answer: (A) Sequence annotation

In the Human Genome Project, sequencing the whole genome without prior knowledge of genes and later assigning functions to different segments is called sequence annotation. Expressed sequence tags is the other approach, which identifies only genes that are expressed as RNA.

40. Answer: (C) (A) is correct but (R) is not correct

Genes located close together on the same chromosome are linked and tend to be inherited together, so they do not assort independently; the Assertion is correct. The Reason, which says closely located genes assort independently, is false.

41. Answer: (B) (a), (c), (d) and (e) only

Springwood (earlywood) is formed when the cambium is very active, producing xylem elements with wide vessels; it is lighter in colour and has lower density, and with autumn wood it forms the annual rings. Statement (b) is wrong because spring season vessels are wide, not narrow.

42. Answer: (A) Protect and conserve the whole ecosystem

In situ conservation protects the whole ecosystem in which species live, through biodiversity hotspots, national parks, sanctuaries and biosphere reserves. It is not limited to high-risk or endangered species, and extinct species cannot be conserved at all.

43. Answer: (D) Pavo, Psittacula, Corvus

Birds have a crop and a gizzard as additional chambers of the digestive tract; Pavo (peacock), Psittacula (parrot) and Corvus (crow) are all birds. The other groups each include non-birds such as Chameleon, Bufo, Balaenoptera, Bungarus, Catla and Crocodilus.

44. Answer: (A) 3.3×10^9 bp

The distance between two consecutive base pairs is 0.34 nm = 0.34×10^{-9} m. Number of base pairs = 1.1 m ÷ (0.34×10^{-9} m) ≈ 3.2×10^9, i.e. about 3.3×10^9 bp; 6.6×10^9 is the number of bases (or bp of a diploid cell), not the base pairs in this molecule.

45. Answer: (C) Statement I is correct but Statement II is incorrect

In autoimmune disorders the body's defence mechanism treats its own cells as foreign and attacks them, so Statement I is correct. Rheumatoid arthritis is an autoimmune disease in which the body does attack self cells, so Statement II is incorrect.

46. Answer: (D) (b), (c) and (e) only

Spermatids differentiate into sperms only after meiosis is complete (b), sperm production comes from a continuously dividing population of spermatogonia (c), and spermatogenesis starts at puberty (e); in oogenesis meiosis II is completed only after sperm entry and the process begins in the foetus. Haploid gamete formation and control by LH and FSH are common to both processes.

47. Answer: (C) (A) is correct but (R) is not correct

Osteoporosis is an age-related disorder with decreased bone mass and increased chance of fractures, so the Assertion is correct. Its common cause is decreased, not increased, levels of estrogen, so the Reason is false.

48. Answer: (A) Both Statement I and Statement II are correct

Each restriction endonuclease recognises a specific palindromic nucleotide sequence, and it cuts each strand a little away from the centre of the palindrome but between the same two bases on the opposite strands, producing sticky ends. Both statements are correct.

49. Answer: (C) Non-Medicated IUD

Lippes loop is a non-medicated intrauterine device. Copper-releasing IUDs are CuT, Cu7 and Multiload 375, while cervical caps and vaults are barrier methods, not IUDs.

50. Answer: (B) 5 ml

Under normal physiological conditions every 100 ml of oxygenated blood delivers about 5 ml of O_2 to the tissues. The value 4 ml is the CO_2 delivered by 100 ml of deoxygenated blood to the alveoli.

51. Answer: (A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Vertebrates have a notochord only in the embryo, and it is replaced by a cartilaginous or bony vertebral column in the adult; chordates such as urochordates and cephalochordates keep the notochord and lack a vertebral column. Hence all vertebrates are chordates but not all chordates are vertebrates, and the Reason explains the Assertion.

52. Answer: (D) Neuroglia

Neuroglia are supporting cells of neural tissue. Blood is a fluid connective tissue, adipose tissue is a loose connective tissue, and cartilage is a specialised connective tissue.

53. Answer: (D) Pavo

Birds, reptiles, land snails and insects are uricotelic and excrete uric acid as a pellet or paste with minimum water loss; Pavo (peacock) is a bird. Ornithorhynchus (a mammal) and Salamandra (an amphibian) are ureotelic, and Hippocampus (a bony fish) is ammonotelic.

54. Answer: (B) DNA replication occurs in S phase of Meiosis-II

DNA replication occurs only once, in the S phase of interphase before meiosis I; there is no S phase before meiosis II. Meiosis does have two stages, pairing and recombination occur in meiosis I, and four haploid cells result at the end of meiosis II.

55. Answer: (C) z, y, a genes will not be translated

If the repressor made by the mutated i gene cannot bind the inducer, lactose cannot inactivate it; the repressor stays on the operator, RNA polymerase cannot transcribe the operon, and so z, y and a are not transcribed or translated. Transcription of z, y and a would need an inducible repressor, which is lost here.

56. Answer: (A) Arthritis - Inflammed joints

Arthritis is inflammation of joints. Tetany results from low, not high, Ca^{2+} in body fluid; myasthenia gravis is an autoimmune disorder, not a genetic one; and muscular dystrophy is a genetic, not autoimmune, disorder.

57. Answer: (A) Trichoderma polysporum

Cyclosporin A, used as an immunosuppressant in organ transplant patients, is produced by the fungus Trichoderma polysporum. Aspergillus niger produces citric acid, Clostridium butylicum butyric acid, and Streptococcus produces streptokinase (Saccharomyces is the 'cerevisiae' species).

58. Answer: (C) Statement I is correct but Statement II is incorrect

Mycoplasma are the smallest living cells and can pass through filters smaller than 1 micron. They completely lack a cell wall, so Statement II is incorrect.

59. Answer: (D) Statement I is incorrect but Statement II is correct

The coagulum (clot) is a network of threads called fibrins, formed from fibrinogen by thrombin; thrombin is the enzyme, not the threads. The spleen is called the graveyard of RBCs, so only Statement II is correct.

60. Answer: (C) $C_{12}H_{22}O_{11}$

Maltose forms when two glucose molecules ($C_6H_{12}O_6$) are joined by a glycosidic bond with the loss of one water molecule: $2\ C_6H_{12}O_6 - H_2O = C_{12}H_{22}O_{11}$. Simply doubling glucose gives $C_{12}H_{24}O_{12}$, which ignores the water removed.

61. Answer: (C) Only RER are present in prokaryotes

Prokaryotic cells lack membrane-bound organelles, including any endoplasmic reticulum, so the statement that only RER is present in prokaryotes is incorrect. RER bears ribosomes, SER lacks them, and SER is the major site of lipid synthesis.

62. Answer: (B) Mesothorax

In cockroach the first pair of wings, the leathery tegmina, arise from the mesothorax, and the second pair of membranous wings from the metathorax. The prothorax bears no wings.

63. Answer: (C) Statement I is correct but Statement II is incorrect

The release of sperms from the Sertoli cells into the lumen of the seminiferous tubules is called spermiation, so Statement I is correct. Spermiogenesis is the transformation of spermatids into sperms; formation of sperms from spermatogonia is spermatogenesis, so Statement II is incorrect.

64. Answer: (A) 0.1

Death rate = number of deaths ÷ population size per unit time = 8 ÷ 80 = 0.1 individuals per Drosophila per week. 10 is the percentage, not the per-individual rate.

65. Answer: (B) Directional change

When more individuals acquire a character value other than the mean, the population mean shifts in one direction, which is directional selection. Stabilising selection favours the mean value, and disruptive selection favours both extremes.

66. Answer: (D) Provides surface for diffusion of O_2 and CO_2

The conducting part (nose to terminal bronchioles) transports air, clears it of foreign particles, humidifies it and brings it to body temperature. Diffusion of O_2 and CO_2 takes place in the respiratory or exchange part, the alveoli, not in the conducting part.

67. Answer: (B) Embryonic development stage

Oogenesis is initiated during embryonic (foetal) development, when oogonia form inside the foetal ovary and enter meiosis I as primary oocytes. It is not started at birth, puberty or adulthood; puberty only resumes the process.

68. Answer: (D) Genetically engineered lymphocytes are not immortal cells.

In ADA gene therapy, the patient's lymphocytes are grown in culture, the functional ADA cDNA is introduced with a retroviral vector, and the cells are returned to the patient. Because these lymphocytes are not immortal, they die and infusions must be repeated periodically; a permanent cure needs the gene to be put into early embryonic or marrow stem cells.

69. Answer: (B) Spindle fibres attach to centromere of chromosomes

In mitosis spindle fibres attach to the kinetochores, small disc-shaped structures at the surface of the centromere, not to the centromere itself, so that statement is the incorrect one. Chromosomes do line up at the equator in metaphase, centromeres split at anaphase, and chromosomes decondense at telophase.

70. Answer: (B) Fragmentation

The breakdown of detritus into smaller particles by detritivores such as earthworms is called fragmentation, the first step of decomposition. Catabolism is the enzymatic breakdown into simpler inorganic substances and humification is the formation of humus.

71. Answer: (D) 100%

The man received his only X chromosome from his colour-blind mother, so he is colour blind (X^cY), and the colour-blind woman is X^cX^c. Every daughter (X^cX^c) and every son (X^cY) will be colour blind, so the chance is 100%.

72. Answer: (D) Acquired immunity is non-specific type of defense present at the time of birth.

Acquired immunity is pathogen-specific and develops during life, with a primary response on first encounter and an amplified anamnestic (secondary) response from memory on later encounters. A non-specific defence present at birth describes innate immunity, so that statement is incorrect.

73. Answer: (B) (b) only

For genetically engineered insulin, Eli Lilly prepared DNA sequences for the A and B chains, produced them separately in E. coli, extracted them and joined them by disulphide bonds. The C-peptide and the processing of pro-insulin concern insulin made in the body, while insulin from cattle and pigs and the allergic reactions it caused are about animal insulin, not the genetically engineered product.

74. Answer: (C) Blood moves freely from atrium to the ventricle during joint diastole.

During joint diastole the tricuspid and bicuspid valves are open, so blood flows freely from the atria into the ventricles. The action potential that starts atrial contraction comes from the SA node, not the AV node; and a rise in ventricular pressure closes the atrioventricular valves and opens the semilunar valves.

75. Answer: (D) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

Glycogen is a storage polysaccharide, globulins include antibodies (immunoglobulins), some steroids such as sex hormones and cortisol are hormones, and thrombin is an enzyme (biocatalyst) in blood clotting.

76. Answer: (C) 60 cells

E. coli divides every 20 minutes, so in 60 minutes there are 3 generations and 10 cells become $10 \times 2^3 = 80$ cells. By semiconservative replication the 20 original ^{15}N strands stay in 20 hybrid cells, so $80 - 20 = 60$ cells have DNA completely free of ^{15}N.

77. Answer: (D) a, c, b, d

Recombination frequency reflects distance: a–c = 5 and c–b = 15 add up to a–b = 20, so c lies between a and b. b–d = 9, c–d = 24 (15 + 9) and a–d = 29 (20 + 9) place d beyond b, giving the order a, c, b, d.

78. Answer: (B) (b), (d) and (e) only

Parathyroid hormone raises blood Ca^{2+}: it stimulates bone resorption, increases reabsorption of Ca^{2+} by renal tubules and increases absorption of Ca^{2+} from digested food. So decreasing blood Ca^{2+} (b), decreasing Ca^{2+} absorption (d) and increasing carbohydrate metabolism (e) are not its effects.

79. Answer: (D) Presence of two or more recognition sites

A cloning vector should have an origin of replication, a selectable marker and a single recognition site for a given restriction enzyme. Two or more recognition sites for the same enzyme would cut the vector into several fragments and complicate cloning, so they are not desirable.

80. Answer: (D) Flippers of penguins and dolphins are a pair of homologous organs

Flippers of penguins (birds) and dolphins (mammals) have similar function but evolved independently, so they are analogous, not homologous, organs; that statement is not true. Analogous structures do arise by convergent evolution, sweet potato (root) and potato (stem) are an example of analogy, and homology indicates common ancestry.

81. Answer: (D) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.

Transmission across an electrical synapse, where the membranes are very close and current flows directly between neurons, is faster than across a chemical synapse, which relies on release and diffusion of neurotransmitters. So the claim that chemical synapses are always faster is incorrect.

82. Answer: (A) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

Bronchioles are lined by ciliated epithelium, goblet cells are unicellular glandular tissue, tendons are dense regular connective tissue, and adipose tissue is a loose connective tissue.

83. Answer: (B) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

Diaphragms cover the cervix and block sperm entry; oral pills inhibit ovulation and implantation; IUDs increase phagocytosis of sperms within the uterus; and lactational amenorrhoea is the absence of menstruation and ovulation during intense breastfeeding after parturition.

84. Answer: (A) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera

Cyanobacteria are photosynthetic autotrophs placed in Kingdom Monera. Bacteria are not exclusively heterotrophic (many are autotrophs), slime moulds are saprophytic protists, and Mycoplasma lack a cell wall.

85. Answer: (B) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Manganese is needed for splitting of water during photosynthesis, magnesium activates enzymes of respiration and photosynthesis, boron is required for pollen germination, and iron activates catalase.

86. Answer: (B) food is transported

In a girdling experiment a ring of bark (including phloem) is removed; the bark above the ring swells with accumulated food and the root eventually starves. This shows that food is translocated through the phloem, while water continues to move up through the intact xylem.

87. Answer: (C) The movement is aided by cytoplasmic streaming

The apoplastic pathway runs through cell walls and intercellular spaces without crossing membranes and offers no barrier until the Casparian strip. Movement aided by cytoplasmic streaming happens in the symplast, through the cytoplasm and plasmodesmata, not in the apoplast.

88. Answer: (C) Electrostatic Precipitator

An electrostatic precipitator charges dust particles with high-voltage electrode wires and collects them on earthed plates, removing over 99% of particulate matter from thermal power plant exhaust. A catalytic converter treats vehicle exhaust gases, an incinerator burns waste, and an STP treats sewage.

89. Answer: (B) Frankia

Frankia is the actinomycete that forms nitrogen-fixing root nodules on the non-leguminous plant Alnus. Rhizobium nodulates legumes, while Rhodospirillum and Beijerinckia are free-living nitrogen fixers.

90. Answer: (B) lower its water potential

Pure water has the highest water potential (zero); dissolving solutes gives a negative solute potential, so adding more solute lowers the water potential further. It cannot raise it or make it zero.

91. Answer: (B) The same diesel engine is used in CNG buses making the cost of conversion low

Diesel engines had to be converted or replaced to run on CNG, so saying the same diesel engine is used is false. CNG does burn more efficiently, is cheaper than diesel, and cannot be siphoned off or adulterated.

92. Answer: (A) Both Statement I and Statement II are correct

Fatty acids and glycerol are insoluble and cannot be absorbed directly into blood; they are first packed into micelles and then reformed into chylomicrons in the intestinal cells. Chylomicrons pass into the lacteals, the lymph vessels of villi, and finally reach the blood, so both statements are correct.

93. Answer: (D) Digestion of disaccharides

Saliva lubricates the oral cavity, its lysozyme controls bacteria, and salivary amylase digests starch, a complex carbohydrate, into maltose. Saliva has no enzymes to digest disaccharides; these are digested in the small intestine.

94. Answer: (B) Cartilage

Cartilage is present between adjacent bones of the vertebral column (intervertebral discs), as well as at the tip of the nose, outer ear and limb joints. Intercalated discs join cardiac muscle cells, and areolar tissue and smooth muscle are not found there.

95. Answer: (C) Bio-fortification

Breeding crops with higher levels of vitamins, minerals, proteins or healthier fats is biofortification. Biomagnification and bioaccumulation refer to build-up of toxic substances, and bioremediation is cleaning pollutants with organisms.

96. Answer: (B) Conidia

Penicillium, a sac fungus, reproduces asexually by conidia, spores produced exogenously on conidiophores. Zoospores occur in some algae and lower fungi, gemmules in sponges and buds in yeast and Hydra.

97. Answer: (D) Statement I is incorrect but Statement II is correct

Statement I describes the electrostatic precipitator, which uses electrode wires to charge dust; a scrubber instead sprays water or lime to remove gases such as sulphur dioxide, so Statement I is incorrect. Fine particulate matter is removed by the electrostatic precipitator rather than the scrubber, so Statement II is correct.

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