A

24703 **120 MINUTES**

1. Identify the true characteristics of viroids:
   1. They are composed of proteins.
   2. They are infectious agents that infect plants.
   3. They lack a protein coat.
   4. They have a lipid envelope.

   A) 1 only B) 2 & 3 only C) 3 only D) 4 only

2. Identify the correct statements with respect to Pili and Fimbriae:
   1. Formation of Pili is governed by plasmid genes
   2. Formation of Fimbriae is governed by plasmid genes
   3. Formation of Pili is governed by genes of the nucleoid
   4. Formation of Fimbriae is governed by genes of the nucleoid

   A) 1, 2 & 3 only B) 1 only
   C) 1 & 4 only D) 2 & 4 only

3. Identify the **incorrect** statement with respect to bacterial biofilm:
   A) Lipids - Major component of EPS, forming a gel-like matrix
   B) Proteins - Can be part of EPS and contribute to biofilm stability
   C) DNA - Released by bacterial cells, adds to the structural integrity of the biofilm
   D) Quorum sensing - Signaling mechanism used by bacteria to coordinate EPS production and biofilm formation

4. The virus having single stranded DNA as its genome:
   A) Hepadna virus B) Parvo virus
   C) Circo virus D) Papova virus

5. In a retro virus the proteins encoded by gag gene are:
   1. Membrane associated or matrix protein 2. Core-envelope-link
   3. Major capsid 4. Nucleo capsid protein
   5. Transmembrane glycoprotein

   A) 1,2 & 5 only B) 3 & 5 only C) 2 & 3 only D) 1,2,3 & 4 only

6. Which among the following is a negative sense (-RNA) virus?
   A) Rabies Virus B) Influenza virus
   C) Both A&B D) Neither A nor B

7. Which among the following is known to produce high levels of beta carotene?
   A) Dunaliella salina B) Scenedesmus
   C) Spirulina D) Chlorella

8. Cladosiphonic siphonostele is seen in:
A) Selaginella B) Osmunda C) Marsilea D) Pteridium

9. The pteridophyte commonly called Christmas fern:
A) Osmunda regalis B) Polystichum acrostichoides
C) Pteridium aquilinum D) Aspenium nidus

10. Match the following plant groups in List I with their characteristics or concepts in List II:

List I	List II
a. Cordaites	1. Leafy structures resembling modern-day palms
b. Cycads	2. Large, fern-like leaves with prominent veins
c. Glossopteris	3. Cone-bearing plants with palm-like leaves
d. Bennettitales	4. Plants with cone-like reproductive structures, similar to cycads

A) a-4, b-3, c-2, d-1 B) a-4, b-1, c-2, d-3
C) a-2, b-1, c-4, d-3 D) a-2, b-3, c-4, d-1

11. Match list I and List II based on the theories on origin of angiosperms

List I	List II
a. Stachyospory	1. Monocotyledon theory
b. Isoetes	2. Amentiferae theory
c. Gnetales	3. Phyllospermae theory
d. Conifer	4. Angiosperm theory

A) a-4, b-3, c-2, d-1 B) a-3, b-1, c-4, d-2
C) a-3, b-2, c- 4, d-1 D) a-4, b-1, c-3, d-2

12. Which among the following is **not** a tribe of Kerala?
A) Kadar B) Cholanaikan
C) Koraga D) Santhal

13. Role of Osmium tetroxide in a fixative:
A) Cross-linking proteins and preserving cellular structures
B) Acts as a coagulant and fixative for tissues
C) Maintains pH of the solution and aids in fixation
D) Solvent and aids in tissue dehydration

14. Coomassie is brilliant blue target amino acid with :
A) Aromatic group B) Basic side chain
C) Both A & B D) Acidic side chain

15. The molecule used for long distance and efficient transport of nitrogen in leguminous plants:
A) Allantoin B) Glutamine
C) Asparagine D) Ammonium ions

16. The form of inhibition when there is an increase in apparent K_m but value of V_{max} is same is ---- inhibition.
A) Reversible competitive B) Non competitive
C) Uncompetitive D) Irreversible competitive

17. Rotenone inhibits Electron Transport Chain in respiration by binding:
A) Coenzyme Q B) NADH Dehydrogenase
C) Fumarate Hydratase D) Succinate Dehydrogenase

18. The molecule when accumulated provides desiccation tolerance to seeds:
A) LEA protein B) Trehalose C) Glutathione D) All of these

19. Grotthuss mechanism is the general name for:
A) Electrochemical gradient B) Chemiosmosis
C) Proton gradient D) Proton hopping

20. Vitamin B12 is a cofactor for:
A) pyruvate carboxylase B) methylmalonyl-CoA mutase
C) acetyl-CoA carboxylase D) pyruvate dehydrogenase

21. The radioisotope used to study rate of cell division is:
A) P^{32} B) S^{35} C) H^{3} D) I^{131}

22. Unique class of DNA transposons that replicate using a rolling-circle mechanism:
A) LINES B) TIR transposons
C) Helitrons D) Pack-MULEs

23. The codon UGA in mitochondrial DNA acts as:
A) Stop codon B) Codes for Tyrosine
C) Codes for Tryptophan D) Codes for Selenocystein

24. In RNA interference the enzyme that cleaves long hairpin RNAs to SiRNAs and miRNAs is:
A) Ribozyme B) DICER C) Argonaute D) RISC complex

25. Which among the following is the most abundant green house gas?
A) Water vapour (H_2O) B) Methane (CH_4)
C) Nitrous oxide (NO_2) D) Chloro fluro carbon (CFC)

26. The wetland/lake **not** designated as Ramsar site in Kerala:
A) Vembanad-Kol Wetland B) Ashtamudi Wetland
C) Kottoli Wetland D) Sasthamkotta lake

27. The art of Bonsai has its origin in the Chinese art called:
A) Yamadori B) Penjing C) Saikei D) Hon non bo

28. The algorithm that uses global alignment:
A) Needleman-Wunsch B) Smith-Waterman
C) Hirsche's D) None of these

29. The centre of origin of Banana according to Vavilov is:
A) South East Asia B) Africa
C) Central America D) Central Asia

30. The key signalling molecule that plays a central role in inducing Systemic Acquired Resistance is:
A) Jasminic acid B) Ethylene
C) Abscissic acid D) Salicylic acid

31. The volatile organic compound capable of priming plants in a field of pathogen or herbivore attack :
A) Methyl Jasmonic acid
B) Methyl Salicylic acid
C) Green leaf volatiles(GLVs)
D) All the above

32. Which among the following is Birds nest fungus:
A) Cyathus B) Geastrum C) Morchella D) Auricularia

33. **X** is selected as the type specimen when no holotype was indicated at the time of publication:
A) Lectotype B) Neotype C) Isotype D) Paratype

34. The enzyme involved in the lytic cycle of bacteriophage which can degrade the peptidoglycan layer of bacteria is:
A) Chitinase B) Endonuclease
C) Interferon D) Endolysin

35. Identify the histone protein which acts as a linker between nucleosome core particles when DNA is wrapped around a single nucleosome core particle:
A) H1 B) H2A C) H2B D) H3

36. Identify the phenomenon associated with the emission of light by some radioactive substances when they move through a medium faster than the speed of light:
A) Radiation dosimetry B) Radioactive decay
C) Cerenkov radiation D) Redox reactions

37. The primary application of liquid scintillation counting in biological research is:
A) Measurement of absorbance of light by molecules in a sample
B) Visualization of cellular structures using fluorescent labels
C) Detection of radioactively labeled molecules in tissues or cells
D) Separation of macromolecules based on their size and charge

38. The statistical test appropriate for analyzing the association between two categorical variables in a contingency table:
A) Z-test B) t-test
C) Chi-square test D) Analysis of Variance (ANOVA)

39. The primary function of telomerase in DNA replication is:
A) Proofreading DNA for errors
B) Repairing damaged DNA
C) Adding repetitive sequences to the ends of chromosomes
D) Facilitating DNA unwinding during replication

40. The term which describes the variation in the expression of a genotype in different individuals due to environmental factors:
A) Codominance B) Penetrance
C) Epigenetics D) Incomplete dominance

41. The phenomenon where the occurrence of one crossover event between two genes on a chromosome reduces the likelihood of a second crossover event nearby:
A) Segregation B) Interference
C) Recombination D) Independent assortment

42. Identify the correct statements regarding the features of fimbriae:
1. The fimbriae are useful in the creation of biofilm as they will attach the bacteria to different host surfaces to facilitate colonization during bacterial infection
2. The fimbriae also have an important role to play in agglutinating the different blood cells such as leukocytes, erythrocytes, as well as epithelial cells
3. The location of the fimbriae is in the poles of the cell or they might be spread evenly over the entire surface of the bacterial cell
4. Certain mutant bacteria possess no fimbriae and hence cannot adhere to the target surfaces that they usually do. Hence, these mutant bacteria are not able to cause any diseases

A) 2 &3 only B) 1,3 &4 only C) 1 &2 only D) 1, 2, 3 & 4

43. Identify the correctly matched pairs of fossil species with their periods:
1. Calamites- lived during the Carboniferous and Permian periods
2. Sphenophyllum - lived from the end of the Devonian Period to the beginning of the Triassic Period
3. Caytonia- Middle Triassic to Cretaceous
4. Cordaites - Upper Carboniferous

A) 1,2 &3 only B) 1& 4 only C) 2 & 3 only D) 1, 2, 3 & 4

44. Mineral nutrient essential for healthy meristem formation in young parts such as root tips, it also plays a role in flowering stage of a plant, its deficiency show dead shoot tips, brittle foliage, and yellowing of lower leaf tip:
A) Iron B) Manganese C) Boron D) Copper

45. Identify the species gien below which display multiple fruits:
1. Strawberries 2. Pineapple 3. Mulberry 4. Raspberries

A) 1& 2 only B) 2 & 3 only C) 1 &4 only D) 1, 2& 3 only

46. Identify the **mismatched** pair of the economic important plant with the family:
A) White dammar - Sterculiaceae
B) Henna - Lythraceae
C) Nutmeg - Myrsinaceae
D) Sweet potato - Convolvulaceae

47. Identify the correct statements regarding the APG system of classification of flowering plants:
1. Several families or genera have not been placed yet in the system.
2. The orders are recognized under informal groups like Magnoliids, Eudicots. These names do not conform to the ICBN.
3. It adopts the phylogenetic principle of monophyly and polyphyly
4. Classification below the rank of family is not attempted.

A) 3 & 4 only B) 1, 2& 4 only C) 2 & 3 only D) 1 & 4 only

48. Identify the correct statements about the ABC model of flower development which was first formulated by George Haughn and Chris Somerville.:
1. The sepals are solely characterized by the expression of A genes, while the petals are characterized by the co-expression of A and B genes.
2. The B and C genes establish the identity of the stamens and the carpels only require C genes to be active. Type A and C genes are reciprocally antagonistic
3. Function D specifies the identity of the ovule, as a separate reproductive function from the development of the carpels, which occurs after their determination
4. Function E relates to a physiological requirement that is a characteristic of all floral verticils, although, it was initially described as necessary for the development of the three innermost verticils

A) 2, 3& 4 only B) 1 & 2 only C) 3 & 4 only D) 1, 2,3 & 4

49. Identify the features associated with eukaryotic mitochondria:
1. Single circular DNA molecule
2. Ribosomes are 70S
3. Programmed cell death, reactive oxygen species production, and iron-sulphur cluster biogenesis
4. Detoxification

A) 1& 2 only B) 2 & 4 only C) 1 & 3 only D) 1,2, 3 & 4

50. In a honey bee population at Hardy Weinberg equilibrium, allele frequency of 'A' is 0.3, the expected frequency of 'Aa' individuals is:

A) 0.18 B) 0.63 C) 0.42 D) 0.21

51. Identify the correct statements about Xanthophyceae :

1. Siphonous algae are composed of multiple tubular cells each of which has uninucleated to many nuclei
2. The reserve food is chrysolaminarin
3. Pigmentation is chlorophyll a, with small amounts of chl. c, beta carotene and abundant fucoxanthin
4. Most live in fresh water, but some are found in marine and soil habitats; cell walls are composed mainly of pectic substances with smaller amounts of cellulose.

A) 2 & 4 only B) 2& 3 only C) 1 & 4 only D) 1, 2, 3& 4

52. Identify the **mismatched** pairs of group vs algal genus:

1. Ulotrichales - Enteromorpha
2. Oedogoniales - Bulbo¬chaete
3. Chaetophorales - Stigeoclonium
4. Volvocales - Gonium

A) 1 only B) 4 only C) 3 only D) None of these

53. Read the Characteristics given below and identify the group:

1. They are mostly marine and grow in sub-littoral and littoral zones of rocky coasts of temperate and polar regions.
2. Sporangia are developed in distinct groups on both surfaces of the thalli.
3. The gametophytic plants are much reduced and dioecious.
4. Plants of this group possess heteromorphic, diplohaplontic alternation of generations.

A) Ectocarpaceae B) Tilopteridaceae
C) Laminariaceae D) Sargassaceae

54. Which of the following statement is true connected to Ascomycota?

A) A dikaryotic ascus that forms in the ascocarp undergoes karyogamy, meiosis, and mitosis to form eight ascospores.
B) A diploid ascus that forms in the ascocarp undergoes karyogamy, mitosis to form eight ascospores.
C) A zygote that forms in the ascocarp undergoes plasmogamy, meiosis, and mitosis to form eight ascospores.
D) A dikaryotic ascus that forms in the ascocarp undergoes plasmogamy, meiosis, and mitosis to form eight ascospores.

55. Read the characters related to the classes of Haplomastigomycotina and Select the correctly correlated statement with the group/s

1. Chytridiomycetes – Fungi with motile cells with a single tinsel flagellum inserted at the anterior end
2. Hyphochytridiomycetes- Fungi producing zoospores furnished with a single whiplash flagellum inserted at the posterior end.
3. Plasmodiophoromycetes- Parasitic fungi producing biflagellate motile cells with both the flagella of whiplash type inserted at the anterior end.

A) 3 only B) 1 &2 only C) 1 &3 only D) 1, 2 & 3

56. Which among the following members belong to Basidiomycetes?

A) Neurospora, yeasts, morels, truffles
B) Neurospora, Smuts, earthballs, puffballs
C) Puccinia, Puffballs, Cryptococcus, Jelly fungi
D) Neurospora, Rusts, Tremella, Auricularia

57. The father of lichenology in India is:

A) Erik Acharius B) Dalip Kumar Upreti
C) Anupam Dikshit D) Dharani Dhar Awasthi

58. Read the salient features given below and identify the group in the division Marchantiophyta

1. Leaves flattened, in 2 or 3 rows, usually broadened to attachment, often lobed; shoots reclining, erect, or pendent; rhizoids smooth-walled
2. Archegonia terminating shoot, surrounded by a chlorophyllose sheath
3. Sporophyte with seta; sporangium spherical to elongate, with elaters and thickenings of the jacket cell walls, opening by 4 longitudinal lines (rarely helical)

A) Calobryales B) Jungermanniales
C) Sphaerocarpales D) Metzgeriales

59. Consider the features of archegonia from Anthoceros and select the correct statements

1. The mature archegonia remain completely embedded in the dossal surface of the gameto¬phyte including the dozen of cover cells.
2. In the grow¬ing archegonium, the cover cells are usually associated with a mucilage mound
3. Neck consists of a vertical row of 4 to 6 neck canal cells.
4. The Venter consists of a ventral canal cell and a large egg

A) 1, 2, 3 & 4 B) 2,3 & 4 only C) 1 & 2 only D) 1, 3 & 4 only

60. Rosin or colophony is the byproduct primarily obtained from the genus:

A) Cedrus sp. B) Pinus sp.
C) Cephalotaxus sp. D) Dioon sp.

61. Identify the correct statements :
    1. The antherozoids are unicellular, uninucleate and biciliate structure in Lycopodium, Selaginella
    2. The antherozoids are multiciliate in Psilotum, Tmesipteris, Isoetes, Equisetum
    3. Homosporous life-cycle is found in the Psilotum, Tmesipteris, Lycopodium, Equisetum
    4. Heterosporous pteridophytes are obligatorily heterothallic found in the Selaginella, Isoetes, Masilea, Salvinia, Azolla, Regnellidium

    A) 1 & 3 only B) 2 &4 only C) 1,3& 4 only D) 1, 2, 3 & 4

62. Tendrils derived from modified terminal leaflets in:
    A) Naravelia B) Smilax C) Cissus D) Ampelocissus

63. Which among the following is **not** a feature of Cannaceae?
    A) Herbs with perennial rhizome, leaves are large, alternate with prominent midrib and sheathing petiole, petals united below in a tube, adnate to the staminal column, imbricate
    B) Androecium consists of a petaloid stamen with half anther on the margin and 5 petaloid staminodes of which 3 outer imbricate, 2 inner more or less connate
    C) Ovary inferior, 3-celled; ovules many on axile placentation; style passing through the groove of fertile stamen, undivided or 2-lipped or dentate; ovary rarely 1-celled with parietal or basal placentas, a pair of epigynous glands are present that secrete nectar.
    D) Fruit a capsule, seeds many, rounded, with copious hard perisperm and a straight embryo

64. Read the features related to the sub families of Nymphaeaceae. Identify the correctly matched statement/s with the group:
    1. Cabomboideae: Flowers cyclic, trimerous and hypogynous, Perianth segments in two whorls of 3 each, outer one forming sepals and inner petals, Stamens 6. Carpels, 3, free.
    2. Nelumboideae: Flowers acyclic and hypogynous, Perianth-segments indefinite, outer whorl of 5 sepals. Stamens indefinite. Carpels many, free.
    3. Nymphaeaoideae: Flowers hypogynous, perigynous or epigynous, Perianth-segments in indefinite whorls, of 4-5 sepals in each whorl, Stamens indefinite, carpels many, united.

    A) 3 only B) 1 & 2 only C) 2 & 3 only D) 1, 2 & 3

65. Which among the following is **not** a member of Verbenaceae?
    A) Gmelina arborea B) Lippia alba
    C) Congea tomentosa D) Durio zibethinus

66. Consider the features related to wood and chose the correct statements:
1. Colour: Hardwoods tend to be darker than softwoods, which are often lighter.
2. Hardness: Hardwoods are usually stronger, more scratch resistant and harder wearing. If the wood chips easily with a chisel, it's most likely a softwood.
3. Weight: hardwoods are usually less denser than softwoods.
4. Pine, Spruce, Douglas fir are Hardwoods, while Oak, Mahogony, maple are softwoods

A) 2 & 4 only B) 1 &3 only C) 1 & 2 only D) 1, 2,3 & 4

67. Select the correctly matched pair/s related to node vs examples:

1. Unilacunar Node	:	Nerium, Lantana camara, Justicia
2. Trilacunar Node	:	Polygonum, Coriandrum sativum, Aralium
3. Multilacunar Node	:	Clerodendron splendens; Chenopodium album and Withania somnifera

A) 1 only B) 2 only C) 1 & 3 only D) 1, 2 & 3

68. Which among the following denotes abnormal secondary growth in Bignonia?
A) The cambium is normal in disposition and activity to begin with, but it soon cuts off diff¬erent proportions of xylem and phloem in different points
B) Cambial activities continue in the individual bundles for some time and soon cease. So secondary growth is rather limited. Secondary cambium arises on the outer side of the bundles cuts off secondary bundles on the inner side, which remain embedded in a non-vascular tissue conjunctive tissue.
C) The cambium originates in the deep layers of cortex or pericycle go on dividing and producing secondary tissues on the inner side first, and later small amount of new tissues on the outer side and are parenchymatous in nature. Those formed on the inner side differentiate into oval-shaped vascular bundles and radially arranged parenchyma cells
D) Anomalous development results in to the formation of unusual type of phloem which remains embedded in secondary xylem known as interxylaiy phloem. Here the cambium cells for some time produce secondary phloem on the inner side instead of forming normal secondary xylem.

69. Identify the correct statement/s:
1. Coomassie G-250 is the commonly used for protein detection since it can be used to detect as little as 0.1 µg of protein.
2. Coomassie R-250 can be used to quantify the amount of protein in the solution, upon binding with proteins, the dye will produce a bluish tint.

A) 1 only B) 2 only C) Both 1 & 2 D) Neither 1 nor 2

70. Which among the following are true related to stains in micro technique?
1. Acridine Orange is a synthetic dye belonging to the triarylmethane class, used in staining bacterial endospore
2. Eosin is an acidic dye composed of brominated fluorescein, stains cytoplasm and extracellular structures in tissues, imparting a pink or red color. It is often used as a counterstain in combination with hematoxylin in H & E staining.
3. Hematoxylin: is a basic dye derived from the heartwood of certain trees and undergoes oxidation to form hematein, stains nuclei blue or purple.
4. Malachite Green: is used in fluorescence microscopy for vital staining of live cells

A) 2 & 3 only B) 1 & 2 only C) 1 & 3 only D) 1, 2 & 3 only

71. Select the correct embryo type related with the statement given below in dicotyledons:
A) Onagrad type: Basal cell plays little or no role in the development of the embryo
B) Solanad type: Both basal and terminal cells take part in the development of the embryo
C) Chenopodiad type: Basal cell usually forms a suspensor of two or more cells
D) Caryophyllod type: Basal cell contribute the major role in embryo formation

72. Chemicals recorded to be effective in overcoming self-incompatibility in flowers are:
A) Olivomycin B) p-chloromercuribenzonate
C) Cycloheximide D) All of these

73. Identify the correctly matched feature with the embryosac type:
1. Plumbago type of embryo sac is characterized by the absence of synergids and antipodals
2. Adoxa type - 8 nuclei which are formed by the mitotic division of the four haploid nuclei of the coeno-megaspore
3. Penaea type the four haploid nuclei of the coeno-megaspore undergo two successive mitotic divisions forming 16 nuclei.
4. Drusa type 16 nucleate embryo sac characterised by large number of antipodals

A) 2 & 3 only B) 3& 4 only C) 1 & 2 only D) 1, 2, 3& 4

74. Identify the Gymnosperm group that exhibit polyembryony:
1. Cycadales 2. Texales 3. Gnetales 4. Coniferales

A) 3 & 4 only B) 2, 3& 4 only C) 1 &2 only D) 1, 2, 3 & 4

75. Analyze the Balance sheet in photorespiratory pathway and find out the Number of carbons lost or recovered:
A) 18 atoms of carbon have been recovered and 6 atoms of carbon are lost
B) 18 atoms of carbon have been recovered and 9 atoms of carbon are lost
C) 16 atoms of carbon have been recovered and 10 atoms of carbon are lost
D) 16 atoms of carbon have been recovered and 8 atoms of carbon are lost

76. Observe the pattern of apoplastic and symplastic phloem loading and chose the correct statement/s:

	Apoplastic loading	Symplastic loading
1.Type of sugar transported	sucrose	Sucrose+ other oligosugars
2.Type of companion cells in the small vein	Ordinary or transfer cells	Intermediary cells
3.Number of plasmadesmata connecting the sieve tube (including companion cells) to surrounding cells	fewer	abundant

A) 1 & 3 only B) 3 only C) 1 & 2 only D) 1, 2 & 3

77. Identify the correct statements related with plant hormones:
1. Naphthalene acetamide prevents lodging or falling of crop plants during windy season
2. Application of naphthalene acetic acid increases the number of dwarf shoots as well as the number of fruits in apple.
3. Chlorophenoxy propionic acid enhances the quality of vegetable crops by preventing flower formation.
4. Low concentration 2, 4-D is useful in preventing pre¬-harvest fruit drop of Orange and Apple. NAA is similarly useful for checking fruit drop of Tomato.
5. Methyl ester of NAA prevents the sprouting of Potato tubers kept in storage.

A) 2, 4& 5 only B) 1, 2& 3 only C) 4 & 5 only D) 1,2,3,4 & 5

78. Identify the correct statement/s:
1. Phototropin a flavoprotein with two flavin mononucleotide (FMN) chromophores. The protein has a carboxy-terminal domain with a serine/threonine kinase activity. In the amino-terminal half, there are distinct light, oxygen, or voltage regulated domains (LOV1, LOV2) that each bind flavin mononucleotide (FMN). The FMN is noncovalently bound to a LOV domain in the dark, but becomes covalently linked upon exposure to suitable light
2. Cryptochrome possesses two domains, an amino-terminal photolyase-related (PHR) region and a carboxy-terminal domain of varying size. The PHR region appears to bind two chromophores, cofactors that absorb light; one chromophore is flavin adenine dinucleotide and the other 5, 10-methenyltetrahydrofolate (pterin or MTHF)

A) 1 only B) 2 only C) Both 1 & 2 D) Neither 1 nor 2

79. Which among the conditions promote Z-DNA conformation from B-DNA conformation?
1. Negative DNA super coiling 2. High salt concentration
3. 5-methylated cytosine

A) 1 & 3 only B) 1 & 2 only C) 2 & 3 only D) 1, 2 & 3

80. The strength of a chemical bond is directly proportional to the amount of energy required to break it. Therefore, bond energy is:
1. Directly proportional to the bond length.
2. Inversely proportional to the bond order.
3. Inversely proportional to the atomic radii of the atoms participating in the bond (since the atomic radius is directly proportional to bond length).
Select the correct statement given above related to bond energy

A) 1 & 2 only B) 3 only C) 1 & 3 only D) 1, 2 & 3

81. Which of the following statements given below is true?
A) Tryptophan and tyrosine are significantly more polar than phenylalanine
B) Amino acids contain aliphatic R groups that are polar are Valine, leucine, isoleucine,
C) Aspartate and glutamate amino acids having R groups with a positive net charge at pH 7.0
D) Lysine is a non-essential amino acid

82. The phospholipids such as Phosphatidylinositol, phosphatidylglycerol and phosphatidylserine are easily separated by:
A) Absorption chromatography
B) HPLC
C) Gas-liquid chromatography
D) Thin layer chromatography

83. Identify the **incorrectly** matched pair:
A) Racemases - Interconversion of L and D stereoisomers
B) Carboxylases - Ligases enzyme
C) Statin drugs - Irreversible inhibitor used to control cholesterol
D) Binding energy - Free energy released in the formation of enzyme-substrate interaction

84. The standard free energy change ΔG° for the hydrolysis of ATP is - 7.3 kcal/mol and that for the hydrolysis of glucose-6-phosphate is - 3.3 kcal/mol, what is the ΔG° for the phosphorylation of glucose using ATP?
A) +10.6 kcal/mol B) +4.0 kcal/mol
C) -10.6 kcal/mol D) -4.0 kcal/mol

85. Identify the statement/s true about motor proteins:
1. The rate of movement of kinesin and dynein along the microtubule is determined primarily by the ATPase domain of the proteins.
2. Kinesin moves along the microtubule in the minus direction, whereas dynein moves in the plus direction.
3. Motor proteins are the driving force behind movements generated by cilia and flagella.

A) 1 & 3 only B) 1 & 2 only C) 3 only D) 1, 2 & 3

86. The concept of transmembrane proteins was obtained from the results of which technique?
A) Single particle tracking or SPT
B) Freeze-fraction replication
C) Freeze-fracture replication
D) Fraction replication

87. Identify the correct statements related to cell cycle regulators:
1. Maturation-promoting factor complexes add phosphate tags to several different proteins in the nuclear envelope, resulting in its breakdown and also activate targets that promote chromosome condensation and other M phase events
2. Maturation-promoting factor also triggers its own destruction by activating the anaphase-promoting complex/cyclosome (APC/C), a protein complex that causes M cyclins to be destroyed starting in anaphase.
3. The APC/C first adds an ubiquitin tag to a protein - separase, sending it for recycling. Separase normally binds to, and inactivates, a protein - securin. When separase is sent for recycling, securin becomes active and can do its job. Securin chops up the cohesin that holds sister chromatids together, allowing them to separate.
4. Key to the DNA damage response is a protein called p53, a famous tumor suppressor often described as the guardian of the genome. p53 works on multiple levels to ensure that cells do not pass on their damaged DNA through cell division . First, it stops the cell cycle at the G check point by triggering production of Cdk inhibitor (CKI) proteins.

A) 2, 3& 4 only B) 1, 2& 4 only C) 1 & 3 only D) 1, 2 ,3 & 4

88. Compare the different phases of cell cycle with the statements and select the correct statements
1. G1Phase: cell undergoes rapid growth and performs its routine functions. During this phase, the biosynthetic and metabolic activities of the cell occur at a high rate
2. G0 Phase: resting phase where the cell has left the cycle and has stopped dividing
3. S phase: the amount of DNA in the cell has effectively doubled, though the cell remains in a diploid state
4. G2 phase: is a shortened growth period in which many organelles are reproduced or manufactured. Parts necessary for mitosis and cell division are made during G2, including microtubules used in the mitotic spindle

A) 2, 3& 4 only B) 1&2 only C) 1,3 &4 only D) 1, 2, 3 & 4

89. In E. coli, DNA replication is initiated at the single origin of replication, oriC. Binding of the initiator protein------, locally unfolds the DNA to form two template ssDNA.
A) Dna C B) Dna A C) Dna B D) HU/IHF

90. The RAST ideally measures:
A) IgE antibodies B) Antigen concentration
C) IgG antibodies D) Agglutination

91. Identify the correct statement:
A) Accurate mapping of genes can be done using Single gene mapping
B) In animals cytological study of recombination was done by Creigton
C) The tendency of linkage is directly proportional to the rate of crossing over between two genes
D) In Drosophila male there is no formation of synaptonemal complex, hence no synapsis in the pachytene phase of meiosis I. As there is no synapsis, there is no recombination.

92. Organisms characterized by a relatively constant mortality or survivorship rate throughout their life expectancies belongs to -------Survivorship curve.
A) Type II B) Type I C) Type III D) Type IV

93. Calculate Simpson's Index of Diversity using the data from a plot given below:
1. Tulsi = 2, 2. Lantana =8, 3. Moss =01, 4. Avena =1, 5. Sedge =3.

A) 0.7 B) 1 C) 0.3 D) 0.4

94. Select the group of Greenhouse gases with their increasing order of Global Warming Potential
A) Methane, Nitrous Oxide, Hydrochloroflurocarbon, Sulphur hexafluoride
B) Hydrochloroflurocarbon, Methane, Nitrous Oxide, Sulphur hexafluoride
C) Nitrous Oxide, Methane, Sulphur hexafluoride, Hydrochloroflurocarbon
D) Methane, Hydrochloroflurocarbon, Nitrous Oxide, Sulphur hexafluoride

95. Which of the following can be found as pollutants in the water in some parts of India?
1. Cadmium 2.Nitrate 3. Lead 4.Formaldehyde 5. Uranium

A) 1, 2 and 3 only B) 2, 4 and 5 only
C) 1, 3 and 5 only D) 1, 2, 3 and 5 only

96. Limits in DB during day and Night in residential areas as per the Noise Pollution (Regulation and Control) Rules, 2000 is.
A) 60 & 50 B) 50 & 40 C) 45 & 35 D) 55 & 45

97. The word GREENEX popularized in media recently is connected with:
A) India's first carbon-efficient live index developed by Bombay Stock Exchange in collaboration with IIM Ahmadabad
B) Primarily enhance resilience of crops, livestock & fisheries through development of production & risk management modulated by ICAR.
C) Research networks in the areas of climate change impacts on important socio-economic sectors like agriculture, health, natural ecosystems, biodiversity, coastal zones by NCAP
D) Cumulative target of increasing forest cover on 5 million hectares of land while improving the forest cover on additional 5 hectares by MoEFCC

98. Operation Save Kurma implies to focus on the:
A) Poaching, transportation and illegal trade of live turtles and tortoises
B) Conservation of water bodies
C) Poaching, transportation and illegal trade of big cats of India
D) Poaching, transportation and illegal trade of The Great Indian Bustard

99. Which among the following is/are Constitutional Provisions for Wildlife protection in India?
A) The 42nd Amendment Act, 1976, Forests and Protection of Wild Animals and Birds was transferred from State to Concurrent List.
B) Article 51 A (g) of the Constitution states that it shall be the fundamental duty of every citizen to protect and improve the natural environment including forests and Wildlife.
C) Article 48 A in the Directive Principles of State policy, mandates that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.
D) All the above

100. Identify the **mismatched** pair:
A) Rajiv Gandhi Orang National Park – Assam
B) Namdapha National Park – Arunachal Pradesh
C) Mahatma Gandhi Marine (Wandoor) National Park – Andaman & Nicobar Islands
D) Simlipal National Park – Nagaland

101. Panna Biosphere Reserve in India recognized by UNESCO as part of the Man and the Biosphere (MAB) program in 2020 is in:
A) Madhya Pradesh B) Uttarakhand
C) Meghalaya D) Sikkim

102. E20 is in the news value. It implies:
A) Blend of 20% ethanol and 80% petrol – signifies a substantial step forward towards biofuel
B) Improving renewable energy sector to 20% in 2032
C) Increasing of elephant population in 20 elephant states in India
D) Improving green economy to 20% in India before 2032

103. Identify the events which facilitates speciation:
1. Natural selection 2. Reproductive isolation
3. Genetic drift 4. Geographical isolation
A) 1, 2& 4 only B) 2 & 3 only C) 1& 4 only D) 1, 2, 3 & 4

104. Root suckers are:
A) Insects that suck nutrients from the roots of plants
B) Shoots that arise from roots to form new plant
C) New plant parts that arise from the branches of fruit trees
D) Roots of neighboring plants that share water with the another plant

105. Consider the statements related to Deccan Plateau and chose the correct statements:
1. India's largest biogeographic region, accounting for 42% of the total geographical area.
2. It is a semi-arid region located in the rain shadow of the Western Ghats
3. This bio-geographic zone of peninsular covering India's forests in the states of Madhya Pradesh, Maharashtra, and Odisha. The Vindhya and Satpura hill ranges, the Chhota Nagpur Plateau, the Eastern Ghats, the Tamil Nadu Plains, and the Karnataka Plateau are all part of the central highlands.
4. The majority of the forests are deciduous, but there are areas of greater biological diversity in the hill ranges. The zone, which includes deciduous forests, thorn forests, and degraded scrubland, is home to a variety of wildlife species.

A) 1,3 &4 only B) 1& 2 only C) 2, 3& 4 only D) 1, 2, 3 & 4

106. Which of the following statements given below is correct?
A) Contact freezing: Cold air is blown over the food product, which takes off its heat. The process gets repeated until the product core reaches a temperature of about -18 degrees celsius.
B) Brine freezing: This method is used to freeze products in bulk. Refrigerant gases preferred: Carbon dioxide, Freon 104 and Ammonia.
C) Blast freezing: The product to be frozen is submerged in cold circulating brine. Brine is made of either Calcium chloride or Sodium chloride.
D) Slow freezing occurs when food is directly placed in freezing rooms called sharp freezers. The temperature ranges from -15 to -29°C and freezing may take from 3 to 72 hours

107. During recombinant insulin synthesis, the bond between insulin polypeptide and galactosidase can be removed by using
A) cyanogen bromide B) chymotrypsin
C) carboxy peptidase D) chitin

108. What is Acetosyringone?
A) A phenolic compound secreted by wounded plant tissue and is known to be a potent inducer of Agrobacterium vir genes
B) A poly-cationic derivative of the carbohydrate polymer dextran, and it is one of the first chemical reagents used to transfer nucleic acids into cultured mammalian cells
C) Silicon carbide fibres (SCF) are about 0.3-0.6 pm in diameter and 10-100 pm in length. These fibres are capable of penetrating the cell wall and plasma membrane, and thus can deliver DNA into the cells
D) Chemical used for proliferating embryonic tissues that can be bombarded in cultures and then allowed to proliferate and regenerate.

109. What are Quorn Products?
   A) Healthy source of plant based mycoprotein- meat substitute products of Europe and North America
   B) Healthy source of plant based mycoprotein, biopesticide on sale in Western countries
   C) Healthy source of plant based mycoprotein for pigs and cattles
   D) Healthy source of plant based mycoprotein for fish cultures

110. Identify the true statements :
   1. Arabidopsis thaliana that contains genes from bacteria that could clean TNT and RDX-explosive soil contaminants
   2. First plant-made pharmaceutical for humans was approved: a recombinant human glucocerebrosidase produced in a carrot cell suspension culture system. This enzyme is used to treat Gaucher's disease caused by a mutation of the β-glucocerebrosidase gene
   3. Virus resistant papaya were developed in response to a papaya ringspot virus (PRV) outbreak in Hawaii by incorporating PRV DNA
   4. Genetically modified cassava under development offers lower cyanogen glucosides and enhanced protein and other nutrients called BioCassava

   A) 3 & 4 only B) 2 & 4 only C) 2&3 only D) 1, 2, 3 & 4

111. Read the tools in bioinformatics and select the **mismatched** pair/s:

Tool	Explanation
1.MACAW	indexing and parallel processing techniques for searching DNA and Proteins sequences
2.BLAST	is an algorithm and program for comparing primary biological sequence information
3. FASTA format	is a text-based format for representing either nucleotide sequences or amino acid (protein) sequences, in which nucleotides or amino acids are represented using single-letter codes
4. Genoogle	is both a local multiple sequence alignment program and a sequence editing tool

   A) 1 & 2 only B) 4 only C) 2 & 3 only D) 1 & 4 only

112. What is PRALINE?
   A) Multiple sequence alignment program with many options to optimize the information for each of the input sequences
   B) Flexible sequence alignment program that allows the use of various different measures of similarity
   C) Tool for generating multiple alignments of protein sequences
   D) Pair wise nucleotide sequence alignment for nucleotide sequences < 5 kb it gives colour aligments and a similarity score based upon Myers and Miller

113. What is CARNA?
A) Is a tool for multiple alignment of RNA molecules
B) A program which renders sequence similarities and secondary structure information from aligned sequences for analysis and publication purpose
C) Provides multiple sequence alignment for transmembrane proteins
D) Part of VISTA Tools for Comparative Genomics

114. Which among the following is an example for biocontrol agent?
1. Bacillus amyloliquefaciens FZB42: Antimicrobial potential (fengycin-induced systemic resistance in tomatoes against Sclerotinia sclerotiorum)
2. Trichoderma asperellum T8a: plays a role in biological control against Colletotrichum gloeosporioides and controlling anthracnose disease in mangoes

A) 1 only B) 2 only C) Both 1 & 2 D) Neither 1 nor 2

115. Identify the correct statement/s related to False smut of Paddy:
1. Caused by Ustilaginoidea virens
2. The fungus transforms individual ovaries/grains into greenish spore balls of velvety appearance. Few to several spikelets in a panicle are affected
3. The azole fungicide, propiconazole, has been found to be effective

A) 1 & 2 only B) 1, 2 & 3 C) 1 & 3 only D) 2 only

116. Recently, a Non-conventional Energy Sources namely Geothermal energy plant has been commissioned in India at:
A) Gulf of Kachchh, Gujarat
B) Nagarcoil, TamilNadu
C) Okhla in Delhi
D) Manikaran in Himachal Pradesh

117. International Union for Conservation of Nature (IUCN) had a crucial role in the development of important international treaties, such as:
1. Ramsar Convention on Wetlands (1971)
2. The World Heritage Convention (1972)
3. The Convention on International Trade in Endangered Species (1974)
4. The Convention on Biological Diversity (1992)

A) 2 & 3 only B) 1 & 2 only C) 1,3 &4 only D) 1, 2, 3 & 4

118. Which of the following glycosidic linkage is found in Lactose ?
A) α-1 – 2β of Glucose with Galactose
B) β -1,4 of Galactose with Glucose
C) α1 – 4 Glucose with Glucose
D) α-1 – 2β of Galactose with Glucose

119. Consider the statements related to heat-shock proteins and chose the correct statements:

1. Several classes of HSPs have been described in eukaryotes including plants. They are designated by their approximate molecular weight (kDa) as HSP 110, HSP 90, HSP 70, HSP 60 and low molecular weight (LMW) HSPs (15 – 20 kDa). Ubiquitin synthesis increases during heat stress.

2. HSP70 /DnaK are conserved molecular chaperon proteins; DnaK is ubiquitously expressed both in the prokaryotes and eukaryotes, while HSP70 is only in the eukaryote counterpart.

3. HSP70s are expressed in different cellular locations, including cytosol, nucleus, endoplasmic reticulum (ER) and mitochondria.

4. Hsp70s have housekeeping functions in the cell in which they are built-in components of folding and signal transduction pathways, and quality control functions in which they proof read the structure of proteins and repair misfolded conformers. All of these activities appear to be based on the property of Hsp70 to interact with hydrophobic peptide segments of proteins in an ATP-controlled fashion.

5. HSP 70 has been identified in chloroplasts as the Rubisco subunit binding protein, involved in the assembly of Rubisco holoenzyme.

A) 1,3 &4 only B) 1, 2,4 &5 only
C) 1, 3 & 5 only D) 2, 3 & 5 only

120. The organelle that breaks down very long acyl chain molecules until they reach 8 carbon for beta oxidation in mitochondria:
A) Nucleolus B) Glyoxysomes C) Peroxisomes D) Chloroplast
