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120 MINUTES

1. According to the Beer-Lambert's law, if the width of the cuvette is doubled, absorbance -----.
A) is also doubled B) is reduced by half
C) will be the same D) cannot be measured
2. The nucleus which cannot be analyzed by NMR spectroscopy:
A) ^1H B) ^{35}Cl C) ^{16}O D) ^{13}C
3. Which one of the following is an enzyme engineering technique?
A) Directed evolution B) Random mutagenesis
C) DNA shuffling D) All of the above
4. The weakest electromagnetic wave :
A) X-rays B) Gamma rays
C) Radio waves D) Infrared waves
5. Deposit of microorganisms in repositories is done according to which International agreement
A) TRIPS B) GATT
C) Patent cooperation treaty D) Budapest treaty
6. The dissolved oxygen content of ordinary drinking water lies in the range of ----- mg/l.
A) 2-5 B) 8-10 C) 15-20 D) 25-30
7. The percentage of submergence in a Rotating Biological contactor used in the biological treatment of industrial waste water can be:
A) 60-80 % B) 50-60% C) 30-40% D) 10-20%
8. " Bulking " in activated sludge process can be due to:
A) Excess organic load B) Overgrowth of fungi and protozoa
C) lower pH D) Overgrowth of filamentous bacteria
9. The common intermediate in the ortho and meta pathway of biodegradation of aromatic pollutants is:
A) Catechol B) Phenyl acetic acid
C) Phenol D) Methoxy toluene
10. Alkyl benzene sulphonates, the major water pollutants are mainly:
A) Disinfectants B) Anionic detergents
C) Cationic detergents D) Solubilizing agents
11. The controversial book "Silent Spring" played a larger role in alerting the legislators and the public about the over use of:
A) Antibiotics B) Detergents
C) Chlorofluorocarbons D) Pesticides

12. The selective compound incorporated in the medium used for detection of E.coli through the detection of the enzyme beta glucuronidase is:
 A) MUG B) IPTG C) X gal D) BGL
13. In Graves' disease, binding of auto-antibodies to the receptor for thyroid-stimulating hormone (TSH) result in
 A) overproduction of the thyroid hormones
 B) less production of the thyroid hormones
 C) over production of altered thyroid hormones
 D) less production of altered thyroid hormones
14. Alteplase cleaves plasminogen at the site of its ----- peptide bond to form plasmin.
 A) Ar2561-Val262 B) Arg361-Val362
 C) Arg461-Val462 D) Arg561-Val562
15. Lysozyme hydrolyzes ----- glycosidic bond.
 A) the β -1,3 B) the β -3,1 C) the β -1,4 D) the β -4,1
16. Dipicolinic acid of bacterial endospore is associated with:
 A) heat resistance
 B) germination
 C) spore dispersal
 D) formation of spore from vegetative cell
17. Endoflagella are located within -----.
 A) inner membrane B) mesosomes
 C) the periplasmic space D) the peptidoglycan
18. Bacterial flagella grow by the addition of flagellin subunits:
 A) at the tip B) at the base
 C) at the middle D) at the surface through
19. Gangliosides are:
 A) Glycolipids B) Negatively charged
 C) Both A and B D) None of the above
20. Functional studies of cell membrane proteins can be done by:
 A) Solubilizing by SDS treatment
 B) Solubilizing by Triton X 100 treatment
 C) Solubilizing by CTAB
 D) Denaturing by Phenol
21. Bacteriorhodopsin is a:
 A) H^+ pump B) Ca^{+} pump
 C) Na^+ pump D) Cl^- channel
22. Which among the following shows highest permeability across lipid bilayers?
 A) H_2O B) Cl^- C) Na^+ D) O_2

35. MacConkey agar is a:
 A) selective agar
 B) differentiating agar
 C) selective and differentiating agar
 D) selective and pigmented agar
36. Choose the correct statement:
 A) All the microorganisms are pathogenic to humans
 B) Most of the microorganisms are pathogenic to humans
 C) Only limited number of microorganisms are pathogenic to humans
 D) Microbial association is always harmful to humans
37. PAMPs:
 A) activate innate immune responses
 B) activate adaptive response
 C) inhibit innate immune responses
 D) inhibit adaptive response
38. The secretory component of sIgA provide -----.
 A) site for antigenic attachment
 B) site for activation of signalling pathways
 C) protection to bound antigen
 D) protection from proteolytic enzymes
39. In normal serum, major immunoglobulin will be:
 A) IgM B) IgA C) IgG D) IgD
40. Part of a processed antigen that binds to the major histocompatibility complex molecule is called:
 A) epitope B) paratope C) antitope D) agretope
41. Opsonin bind -----.
 A) antibody and increase binding with antigen
 B) complement and activate complement system
 C) antigen and enhance phagocytosis
 D) TCR and enhance TCR activation
42. Which of the following is well known as interferon stimulated?
 A) Protein kinase R B) Serine protease
 C) Alkaline protease D) Acid protease
43. Which of the following is correct with Tumor-associated transplantation antigens (TATAs)?
 A) TATAs are not unique to tumor cells
 B) TATAs can be proteins that are expressed on normal cells during fetal development
 C) TATAs can be proteins that are normally expressed at extremely low levels on normal cells but are expressed at much higher levels on tumor cells
 D) All the above

44. Which among the following is a tumour suppressor gene?
 A) APC B) SRC C) BRAF D) MYC
45. Rituxan is a humanized antibody used for the treatment of:
 A) Her2 positive breast cancer
 B) Glioblastoma
 C) Triple Negative Breast cancer
 D) Non-Hodgkin's B cell Lymphoma
46. Which among the following is **not** the function of 5' – 3'' exonuclease activity of DNA Pol I?
 A) Proof Reading B) Primer removal
 C) Nick translation D) Excision Repair
47. Haplodiploid sex determination is common in:
 A) Hymenoptera B) Isoptera
 C) Arachnids D) Diptera
48. Bottle neck effect and founder effect are two facets of :
 A) Genetic Drift B) Migration
 C) Mutation D) Selection
49. Dextral and sinistral shell coiling in apple snail is an example of :
 A) Maternal imprinting B) Paternal imprinting
 C) Maternal effects D) Paternal effects
50. In a particular population, 4 % of females are affected by a rare X linked disorder. What is the frequency of the carriers?
 A) 40 % B) 80% C) 32% D) 4%
51. Which among the following is used for targeted editing of genomes?
 A) TALENS B) ZFN
 C) CRISPR- Cas-9 D) All of the above
52. What is the maximum capacity of a lambda replacement vector?
 A) 37 Kb B) 52 Kb C) 22 Kb D) 11 Kb
53. Which among the following is **not** a PCR based molecular marker?
 A) RFLP B) AFLP C) RAPD D) ISSR
54. Which among the following is a type II restriction enzyme with asymmetric sites of recognition?
 A) Bam H I B) Eco RI C) Mbo II D) Pst I
55. The approximate frequency of a 6 base pair sequence in the genome is once in ----- bases.
 A) 256 B) 1 kb C) 4 kb D) 6 kb

56. The diacetyl formation in cultured buttermilk is much influenced by the----- concentration in the medium
 A) Protein B) Salt C) Citrate D) Glucose
57. The role of gluten in bread manufacturing is to increase the -----.
 A) protein content and to increase the shelf life
 B) sugar content and to reduce the size
 C) digestibility and to improve the taste
 D) absorption and to reduce the processing time
58. The two main enzymes involved in acetic acid fermentation:
 A) Carbonic anhydrase and citrate dehydrogenase
 B) Alcohol dehydrogenase and acetaldehyde dehydrogenase
 C) Glucose dehydrogenase and citrate dehydrogenase
 D) Maltose dehydrogenase and carbonic anhydrase
59. “Kimchi “ the Korean fermented food is very similar to:
 A) Kefir B) Kumis C) Sauerkraut D) Yoghurt
60. “Salami”, a fermented meat product is made out of:
 A) Beef B) Pork C) Chicken D) Duck
61. The precursor used in penicillin fermentation is:
 A) Benzoyl acetate B) Ethyl acetate
 C) Phenyl acetic acid D) Propionic acid
62. The probe used for the detection of dissolved oxygen in a bioreactor is a type of:
 A) Clark Electrode B) Polarographic electrode
 C) Thermocouple based D) Optical sensor based
63. The bioreactor successfully used earlier for the production of SCP was
 A) CSTR B) Wheel fermenter
 C) Air lift bioreactor D) Bubble column bioreactor
64. The composition of sephadex used in the gel filtration technique during downstream processing is ----- derived.
 A) Dextran B) Agarose
 C) Acrylamide D) Polyhydroxy butyrate
65. Which of the following can be used for the accurate determination of the molecular weight of a protein?
 A) Ion exchange chromatography
 B) Dialysis
 C) SDS – PAGE
 D) SAGE

66. HAT is:
- A) Hypoxanthine – Aminopterin - Tyrosine
 - B) Hypoxanthine – Aminopterin - Thyroxine
 - C) Hypoxanthine – Alanine - Thymidine
 - D) Hypoxanthine – Aminopterin - Thymidine
67. A selection medium for pUC vectors should contain:
- A) IPTG only
 - B) X gal only
 - C) IPTG and X gal
 - D) IPTG, X gal and ampicillin
68. Phasmids are vectors with -----.
- A) lambda att site
 - B) lambda cos site
 - C) lambda ori
 - D) M13 ori
69. Which among the following is **not** used for automated sequencing?
- A) Sangers
 - B) Maxam and Gilbetz
 - C) Pyrosequencing
 - D) Illumina
70. Yield Gard is a variety of maize with -----.
- A) borer resistance
 - B) Glyphosate resistance
 - C) high fructose content
 - D) blight resistance
71. Control of plant gene expression patented by Delta and Pineland was nicknamed as
- A) Golden technology
 - B) Savior technology
 - C) Terminator technology
 - D) Salvador technology
72. Which among the following is a property of normal cellines?
- A) Contact inhibition
 - B) Infinite growth
 - C) Anchorage independence
 - D) aneuploidy
73. HeLa is a:
- A) Colon cancer cellilne
 - B) Breast cancer celline
 - C) Cervical cancer celline
 - D) Normal celline
74. Pharming in biotechnology means production of pharmaceuticals
- A) in transgenic plants
 - B) in transgenic animals
 - C) in transgenic plants and animals
 - D) in transgenic bacteria
75. The technology used for the creation of Megan and Morag is:
- A) Somatic cell nuclear transfer technology
 - B) Embryonic cell nuclear transfer technology
 - C) Retroviral gene transfer
 - D) Pronuclear micro injection
76. Production of distant plant hybrids is possible by:
- A) Embryo rescue
 - B) Anther culture
 - D) Callus culture
 - D) Meristem culture

77. The following a, b, and c criteria are for:
- Maximum containment and biohazard suits
 - No aerosol creation and air lock
 - Air shower and clothing changing room for all personnel entering and existing the facility
- A) Biosafety level 4 B) Biosafety level 3
C) Biosafety level 2 D) Biosafety level 1
78. The ruling of Calcutta high court in Dimminaco AG v/s Patent controller of India was a major mile stone Indian patent system because it allowed -----.
- product patent
 - process patent
 - patenting of live microorganisms
 - patenting of plant varieties
79. Which among the following is **not** a continuous variable?
- Height of plants
 - No of leaves in a plant
 - Width of leaves
 - All of the above
80. Calculate the standard deviation for the give set of values: 9, 9, 10, 10, 10, 12
- 1
 - 2
 - 4
 - 3
81. What is the probability that a couple's second child will be a girl, given that their first child was a girl?
- 1/4
 - 1/2
 - 3/4
 - 1/3
82. In order to test a null hypothesis you need:
- Data
 - A box model for data
 - A and B both
 - None of the above
83. Other things being equal, which of the following P values is best for the null hypothesis?
- 1%
 - 3%
 - 17%
 - 32%
84. The most genetically stable mapping population from the following is:
- Back cross population
 - NILs
 - RILs
 - DH lines
85. Binary vector system in *Agrobacterium tumefaciens* is advantageous over co integrate vector system.
- Because it ensures higher capacity
 - Because it is stable with both vir genes and TDNA on the same vector.
- A) Both 1 and 2 are correct B) Both 1 and 2 are wrong
C) 1 is correct but 2 is wrong D) 1 is wrong but 2 is correct

86. Match the following:
- | | |
|----------------|------------------------------------|
| List I | List II |
| a. pUC Vectors | 1. Tetracycline resistance |
| b. 22. | 2. Phagemid |
| c. Charon 16 A | 3. Alpha complementation |
| d. pcDNA | 4. Lambda phage replacement vector |
| | 5. Lambda phage insertion vector |
- A) a-1, b-3, c-5, d-4 B) a-5, b-3, c-4, d-1
C) a-3, b-1, c-5, d-2 D) a-5, b-3, c-1, d-2
87. Germline gene therapy is opposed on the grounds of:
- A) Autonomy argument B) Virtue approach
C) Common Good Approach D) Utility approach
88. Which among the following is a non- parametric test?
- A) Students't test B) One way ANOVA
C) Chi square test D) None of the above
89. Which among the following programs are exclusively used for construction Maximum Parsimony phylograms?
- A) PAUP B) Mr Bayes C) RaxML D) CLUSTAL
90. The method used by the Celera Genomics for human genome sequencing:
- A) Clone contig approach B) Shotgun Sequencing
C) Massive parallel sequencing D) New generation sequencing
91. Which among the following is **not** a post TRIPs modification in Indian Patent Act?
- A) Process patent in drugs
B) Term of patent increased to 20 years
C) No license of right
D) Limited use of patented inventions by governments
92. Under plant patents, tubers are **not** included because they are:
- A) agricultural commodities B) propagules
C) storage structures D) both propagule and food material
93. Section 3 and 4 of Indian Patent act deals
- A) Non-patentable inventions B) Plant patents
C) Trade secrets D) Geographical indications
94. Injunction and damages in patent law are the types of:
- A) Infringement B) Remedies C) Acts D) Licensing
95. Which are the limitations of patent act?
- A) Making using and selling the invention
B) Compulsory licence
C) Damages
D) Certificate of validity

96. Bovine serum albumin is added to restriction enzymes because:
- It stabilize DNA
 - It stabilize the cofactors
 - Under low protein concentrations enzymes are not stable
 - It accelerate the H bond formation
97. Formation of -----is essential for activating photoreceptors and initiating vision process.
- Rhodopsin
 - Carotenes
 - 11-cis retinal
 - All-trans retinal
98. Formation of NADH in a reaction can be easily measured by:
- Spectrophotometry
 - Electrophoresis
 - Chromatography-mass spectroscopy
 - Vibrational spectroscopy
99. Chemical digestion of proteins ends in
- The stomach
 - The small intestine
 - The large intestine
 - The anus
100. Energy source of brain during prolonged starvation
- Glucose
 - Fatty acids
 - Ketone bodies
 - Amino acids
101. Agent Orange used by US military for defoliating forests and clearing vegetation in Vietnam war mimics:
- Auxins
 - Gibberellins
 - Cytokinins
 - Abscisic acid
102. Betablockers reduces blood pressure by blocking
- Proton pump
 - Uncouplers
 - Epinephrine
 - None of the above
103. SARS-CoV-2 that causes COVID-19 is commonly isolated using
- Chromatography
 - Density gradient centrifugation
 - Electro focussing
 - Electro fishing
104. A peptide when treated with trypsin yielded fragments Val-Trp-Thr, Gly-Ser- Met- Asp- Lys, and Ile-Tyr-Thr-Asp-Tyr- Lys, and one molecule each of arginine and lysine. The same peptide upon chymotrypsin treatment yielded fragments Asp- Lys- Lys-Ile-Tyr, Gly-Ser- Met, Lys-Arg-Val-Trp-Thr and Thr-Asp-Tyr. Dinitroflouro benzene treatment followed by hydrolysis of the parent peptide yielded dinitrophenyl derivative of glycine. Which free amino acid will be released if the parent peptide is treated with carboxypeptidase?
- Glycine
 - Arginine
 - Threonine
 - Lysine

105. Experimental error during enzyme kinetic analyses will be reflected on both x and y axes in the case of:
- A) MichaelisMenten plot B) Lineweaver Burk Plot
C) EadieHofstee plot D) Both b and c
106. Which osazone is formed fast?
- A) Glucosazone B) Fructosazone
C) Lactosazone D) Maltosazone
107. Membrane fluidity is increased if it contains:
- A) More short chain fatty acids
B) More saturated fatty acids
C) More cis-unsaturated fatty acids
D) Both A and B
108. Active site of an enzyme can be mapped most efficiently by using:
- A) Competitive inhibitors B) Noncompetitive inhibitors
C) Uncompetitive inhibitors D) Suicide inhibitors
109. The method which is most effective in providing stable immobilization of enzymes:
- A) Physical adsorption B) Entrapment
C) Covalent attachment D) Cross-linking
110. Which among the following is **not** a LINUX based OS distribution:
- A) Haiku B) Debian C) Fedora D) Gentoo
111. Which among the following docking algorithms are not based on Monti Carlo?
- A) GROMOS B) GROMACS C) ICM D) FlexX
112. T/A cloning is most suitable for PCR fragments generated by *Taq* DNA polymerase because:
- A) *Taq* is a thermophilic polymerase
B) *Taq* has no processivity
C) *Taq* has limited terminal transferase activity
D) *Taq* is error prone
113. Which among the following is a protein data base?
- A) GENBANK B) DDBJ C) ATCC D) PIR
114. Thermogenin present in brown adipose tissue generates heat by:
- A) Producing more ATP molecules
B) Increasing the proton gradient across the inner mitochondrial membrane
C) Providing proton channel in the inner mitochondrial membrane
D) Increasing the number of mitochondria
115. Enzyme secreted by the sperm cells that assist in fertilization:
- A) Permease B) Urokinase
C) Lipase D) Hyaluronidase

116. How many molecules of ATP are generated during gluconeogenesis?
A) 0 B) 2 C) 36 D) 38
117. The node in a phylogram represent:
A) A common ancestor B) An outgroup
C) A monophyletic group D) A sister taxon
118. Which among the following is an example of sympatric speciation?
A) Squirrels in Grand Canyon
B) Orca
C) Apple maggot fly
D) Midas cichlid
119. Topocloning uses:
A) Topoisomerase B) Gate way system
C) cre- lox system D) CRISPR cas 9
120. Which among the following is the karyotype of Down's syndrome?
A) 47, XX + 21 B) 46, XX + 21
C) 47, XXY D) 46. XY +21
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