1. The higher incidence of colour blindness in males is due to

(A) The gene for colour blindness is found on the Y chromosome.

(B) The recessive gene is usually masked by another X chromosome in females.

(C) Colour blindness is an X-linked dominant trait.

(D) All the sons of an affected male will have the disorder

2. Which of the following pairs of amino acids would carry a negative charge on their side chain at pH 8.0 ?

(A) Asparagine & Glutamine

(B) Leucine & Glycine

(C) Histidine & Lysine

(D) Aspartate & Glutamate

3. The type of microscopy in which the surface of a specimen is bombarded with electrons is known as

(A) Bright-light

(B) TEM

(C) SEM

(D) DIC

4. Which of the following was the first widely used antiseptic and disinfectant ?

(A) Chlorine

(B) Phenol

(C) Iodine

(D) Alcohol

5. Mr. Ananda Chakrabarty received the first U.S. patent for a GM organism. The organism was :

(A) A transgenic mouse expressing the growth hormone gene

(B) Dolly the cloned sheep

(C) Cloned E. Coli

(D) Pseudomonas engineered to degrade petroleum

6. Which cleanup approach involves removing groundwater or soil from its natural setting to allow for bioremediation ?

(A) In situ bioremediation

(B) Ex situ bioremediation

(C) Bioaugmentation

(D) Phytoremediation

7. Which biosensor detects analyte by measuring change in current ?

(A) Amperometric
(B) Optical
(C) Calorimetric
(D) Fluorometric

8. In the Messelson and Stahl's DNA replication experiment, if the cells were first grown for many generations in ^{15}N containing media, and then switched to ^{14}N containing media, what percent of the DNA had 1 light strand and 1 heavy strand after 2 generations of growth in ^{15}N growth media ?

(A) 0
(B) 25
(C) 50
(D) 100

9. An aquatic fern which is an excellent biofertilizer is

(A) Salvinia
(B) Azolla
(C) Marsilea
(D) Pteridium

10. The nature of the poliovirus given for oral vaccination (satin vaccine) as part of the eradication programme is

(A) heat killed virus
(B) live attenuated strains of all three immunological types
(C) small dosage of wild-type live viruses
(D) formalin-inactivated viruses

11. Treatment of municipal water supplies is based upon

(A) coagulation, filtration, chlorination
(B) chlorination, filtration, coagulation
(C) filtration, coagulation, chlorination
(D) coagulation, chlorination, filtration

12. Which of the following is not used for isolation of bacterial colonies ?

(A) Streak plate
(B) Plate assay
(C) Pour plate
(D) Spread plate

13. The cocci which mostly occur in pairs are

(A) Streptococci

(B) Diplococci

(C) Tetracocci

(D) Streptococcus

14. A trait that appears to be dominant in one sex but recessive in the other is called

(A) Sex influenced trait

(B) Sex limited trait

(C) Sex linked trait

(D) None of these

15. The catalytic efficiency of two different enzymes can be compared by the

(A) Molecular size of the enzyme

(B) The pH optimum value

(C) The Km value

(D) Formation of the product

16. In the Hardy-Weinberg equation, the term 2pq represents the frequency of the

(A) Dominant homozygotes

(B) Heterozygotes

(C) Recessive heterozygotes

(D) Homozygotes

17. Cell signals with short-lived local effects are called _____

(A) Holocrine

(B) Apocrine

(C) Paracrine

(D) Merocrine

18. The key enzyme in the regulation of fatty acid synthesis is

(A) acetyl CoA carboxylase

(B) AMP activated proteinkinase

(C) protein phosphatase

(D) pyruvate kinase

19. If the enthalpy change for a reaction is zero, ΔG° is equal to

(A) $T\Delta S^\circ$

(B) $-T\Delta S^\circ$

(C) $-\Delta H^\circ$

(D) lnKeq

20. Nucleotide bases and aromatic amino acids absorb light respectively at

(A) 280 and 260 nm

(B) 260 and 280 nm

(C) 270 and 280 nm

(D) 260 and 270 nm

21. The glyoxylate cycle is used by some microorganisms when_____ is the sole carbon source.

(A) acetate

(B) nitrate

(C) carbon dioxide

(D) pyruvate

22. The Monod model predicts that the specific growth rate

(A) will increase with the concentration of the growth limiting substrate until it reaches a maximum value

(B) will decrease with the concentration of the growth limiting substrate

(C) will increase with the concentration of the growth limiting substrate

(D) does not depend on growth limiting substrate

23. What are the main constituents of culture for animal cell growth ?

(A) Glucose and Glutamine

(B) Growth factors

(C) Cytokines

(D) Lactose

24. Circular Dichroism (CD) spectrometry measures

(A) optical activity of the protein

(B) primary structure of the protein

(C) conformational changes in the protein

(D) function of the protein

25. What are different substrates used for ethanol production ?

(A) Starch containing substrate

(B) Juices from sugarcane or molasses or sugar beet

(C) Waste product from wood or processed wood

(D) All of the above

26. In competitive inhibition,

(A) V_{max} is increased

(B) K_M is increased

(C) V_{max} is decreased

(D) K_M is decreased

27. Which of the following biosensor is commercially used to monitor glucose level ?

(A) Hexokinase biosensor

(B) Glucose oxidase biosensor

(C) Glucokinase biosensor

(D) Fructokinase biosensor

28. Which of the following is not patentable under 1988 Act ?

(A) Manufacturing processes

(B) New product

(C) Mathematical processes

(D) Chemical formula

29. A continuous reactor at steady state contains 0.04 $g.l^{-1}$ of biomass and 0.02 $g.l^{-1}$ of phenol. The feed contained 0.1 $g.l^{-1}$ of phenol. The biomass yield would be

(A) 0.4 $g.g^{-1}$

(B) 0.5 $g.g^{-1}$

(C) 1.0 $g.g^{-1}$

(D) 5.0 $g.g^{-1}$

30. Which of the operation does not come under upstream processing ?

(A) Media preparation

(B) Inoculum development

(C) Effluent treatment

(D) Storage of raw material

31. Micro filtration refers to the separation of suspended material such as bacteria by using a membrane with spore sizes of

(A) 0.02 to 10μm

(B) 1-10A°

(C) 20-30μm

(D) 10-200A°

32. The basis of chromatography technique is

(A) the absorption of infrared radiation by the components.

(B) the interaction of the components with both stationary and mobile phases.

(C) the differing movement of particles of different mass in an electric field.

(D) the deflection of charged particles in a magnetic field.

33. What is the concentration of CO_2 required for culturing animal cells ?

(A) 5%

(B) 12%

(C) 15%

(D) 20%

34. Three types of RNA involved in comprising the structural and functional core for protein synthesis, serving as a template for translation and transporting amino acid respectively, are :

(A) mRNA, tRNA, rRNA

(B) rRNA, tRNA, mRNA

(C) tRNA, mRNA, rRNA

(D) rRNA, mRNA ,tRNA

35. Phytoremediation can clean up polluted soils by using _____.

(A) plants to take up and accumulate the pollutant so that it can be removed when the plant is harvested

(B) plant cover to prevent surface soil heating

(C) anaerobic bacteria to degrade toxic compounds

(D) aerobic bacteria to degrade toxic compounds

36. A set standards used to regulate own or community activity in relation to biological world is

(A) Biopotency
(B) Biopiracy
(C) Biowar
(D) Bioethics

37. The relationship between K_{eq}, K_m and V_{max} is known as

(A) Haldane equation
(B) Michaelis Menten equation
(C) Numerical solution approach
(D) Gibbs-Helmholtz equation

38. Fluidized bed bioreactors provide higher mass transfer rates than packed bed bioreactors because

(A) mixing is higher in fluidized bed bioreactors
(B) particles move with the fluid in a fluidized bed bioreactor
(C) immobilized particles are smaller in the fluidized bed bioreactors
(D) immobilized particles are larger in the fluidized bed bioreactors

39. The Ramachandran Plot illustrates the fact that

(A) the peptide bond is planar
(B) the F & Y angles can assume any value in a peptide
(C) the F & Y angles can assume only a single value in a protein
(D) the F & Y angles can assume approximately three different values

40. Which of the following statements is false concerning a mating between F^+ and F^-cell ?

(A) the F^-cell is converted to an F^+cell
(B) the F^+cell is converted to an F^-cell
(C) chromosomal genes are rarely transferred
(D) the genes involved in pilus formation are transferred at high frequency

41. Which of these mechanisms for thymine dimers repair lead to mutations ?

(A) Nucleotide excision repair
(B) Photoreactivation
(C) SOS repair
(D) Base excision repair

42. The range of width for the baffle in the fermentor is _____ times of vessel diameter.

(A) 1/10 to 1/12

(B) 1/8 to 1/10

(C) 1/5 to 1/8

(D) 1/2 to 1/5

43. Exclusive vessel used in animal cell culture is

(A) T-flask

(B) Watch glass

(C) Slide

(D) Petridish

44. What was the first protein whose complete tertiary structure was determined ?

(A) Lysozyme

(B) Myoglobin

(C) Pancreatic ribonuclease

(D) Pancreatic DNase

45. A messenger acid is 636 nucleotides long, including the initiator and termination codons. The number of amino acids in the protein translated from this mRNA is :

(A) 212

(B) 230

(C) 211

(D) 110

46. The rate limiting step in the movement of oxygen from the gas phase in a bubble to the cell is the movement of oxygen molecules through

(A) gas-liquid interface

(B) bubble boundary layer

(C) bulk liquid

(D) gas phase

47. The main site for gluconeogenesis is

(A) Kidney

(B) Brain

(C) Liver

(D) Muscle

48. How many amino acids will be encoded by 5' GAU GGU UGA UGU 3' sequence ?

(A) One

(B) Two

(C) Three

(D) Four

49. One of the following is a powerful technique used in characterisation of cultured cells

(A) Spectroscopy

(B) Microscopy

(C) Flow cytometry

(D) Liquid chromatography

50. Which of the following forces is the most favourable for protein folding ?

(A) Conformational entropy

(B) Hydrophobic Interactions

(C) Vander Waals interactions

(D) Hydrogen bonds

51. Embryonic stem cells were first derived from

(A) pigs

(B) mouse

(C) humans

(D) monkeys

52. Beer's Law states that

(A) absorbance is proportional to both the path length and concentration of the absorbing species

(B) absorbance is proportional to the log of the concentration of the absorbing species

(C) absorbance is equal to P_0 / P

(D) absorbance is equal to f

53. Which of the following is strategic approaches to protein engineering ?

(A) De novo design

(B) Rational design

(C) Directed evolution

(D) All of the above

54. 3-D structure of the protein is experimentally determined by

(A) Nuclear Magnetic Resonance

(B) Spectroscopy

(C) Flourescene

(D) Circular dichroism

55. Which of these hormones is also known as catecholamine ?

(A) Follitropin

(B) Norepinephrine

(C) Tetraiodothyronine.

(D) Tetrahydrofolate

56. If the molar amount of G in a DNA sample is 20%, what is the molar amount of T in the sample ?

(A) 20%

(B) 30%

(C) 40%

(D) 60%

57. In a rare blood type referred to as the Bombay phenotype, individuals with recessive gene "H" have the Bombay phenotype and their blood type is type "O" regardless of their ABO genotype. How can we explain this ?

(A) Multiple alleles

(B) Epistasis

(C) Overdominance

(D) Environmental influence

58. The primary RNA transcript of the chicken ovalbumin gene is 7700 nucleotides long, but the mature mRNA that is translated on the ribosome is 1872 nucleotides long. This size difference occurs primarily as a result of

(A) capping

(B) cleavage of polycistronic mRNA

(C) removal of poly A tails

(D) splicing

59. Suitable bio-reactor used for the cell culture based products is

(A) Continuous Stirred Tank Reactor

(B) Plug flow bioreactor

(C) Continuous flow stirred tank bioreactor

(D) Hollow fiber bioreactor

60. Teichoic acids are typically found in

(A) cell walls of gram positive bacteria

(B) outer membranes of gram positive bacteria

(C) cell walls of gram negative bacteria

(D) outer membranes of gram negative bacteria

61. Composite transposons contain

(A) Inverted repeats

(B) Two pairs of inverted repeats flanking an intervening gene

(C) Two pairs of direct repeats flanking an intervening gene

(D) Direct repeats

62. With respect to the Lac operon, if both glucose and lactose are present and glucose is low, which of the following is NOT true ?

(A) High CAP

(B) Increased uptake of lactose

(C) Low cAMP

(D) Increased transcription of the lac operon

63. Cells which have undergone transformation regularly become

(A) anchorage independent

(B) anchorage dependent

(C) stable

(D) unstable

64. The stability of the enzyme T4 lysozyme can be increased by the addition of

(A) Hydrogen bonds

(B) Disulphide bonds

(C) Glycosidic bonds

(D) Covalent bonds

65. Expression of heat shock genes is controlled by

(A) an alternative sigma factor

(B) a helix-turn-helix DNA binding protein

(C) the response regulator

(D) operator regions

66. Which of the following technique is used in establishment of primary culture ?

(A) Enzymatic dissociation

(B) Enzymatic reassociation

(C) Indirect contact

(D) Direct contact

67. A 10-year-old boy comes to the hospital after eating wild mushrooms. The poison associated with these mushrooms inhibits the synthesis of the following

(A) hn RNA

(B) t RNA

(C) DNA

(D) m RNA

68. A household survey of 10 families was conducted by students of 4th year MBBS. In the collected data, the ages of heads of families were : 32, 34, 35, 36, 36, 42, 44, 46, 48, and 52. The mean age of heads of families is

(A) 36

(B) 38.5

(C) 40

(D) 40.5

69. Growth hormone that produces apical dominance is

(A) Ethylene

(B) Gibberlin

(C) Cytokinin

(D) Auxin

70. The software programme used for automated *de novo* drug design is

(A) LUDI

(B) DOCK

(C) CoMFA

(D) Chem3D

71. What is measured with an Auxanometer ?

(A) Photosynthetic activity

(B) Growth activity

(C) Respiratory activity

(D) Osmotic activity

72. On which genetically modified plant were the first field trials done ?

(A) Strawberry seedlings sprayed with "ice-minus" bacteria

(B) Bt Corn

(C) Flavr Savr tomato

(D) Bt Cotton

73. Monoclonal antibodies recognize a single :

(A) Antigen

(B) Epitope

(C) Paratope

(D) B cell

74. What is *de novo* drug design ?

(A) The design of a novel drug based on molecular modelling studies of a binding site.

(B) The modification of a drug based on molecular modelling studies into how it binds to its target binding site.

(C) The design of the synthesis required to generate a novel range of structures.

(D) The synthesis of a compound from simple starting materials.

75. Among the land plants which group is most restricted to moist environments ?

(A) Angiosperm

(B) Bryophyta

(C) Spenophyta

(D) Lycophyta

76. Which of the following penicillin is produced in large scale by submerged fermentation

(A) Penicillin-A

(B) Penicillin-G

(C) Penicillin-D

(D) Penicillin-F

77. The temperature required for production of citric acid is

(A) 35 ºC – 40 ºC

(B) 25 ºC – 30 ºC

(C) 20 ºC – 25 ºC

(D) 10 ºC – 15 ºC

78. *Bacillus thuringenesis* is

(A) Fungicide

(B) Microbicide

(C) Bacteriocide

(D) Insecticide

79. Continuous feed during fermentation is used to maintain

(A) Temperature

(B) Water level

(C) Substrate concentration

(D) Cell number

80. The first recombinant antigen vaccine approved for human use is

(A) Hepatitis B vaccine

(B) Hib vaccine

(C) Var vaccine

(D) DPT vaccine

81. Choose the incorrect statement about Active Site of an enzyme-

(A) The active site is a three-dimensional cleft

(B) The active site takes up a large part of the total volume of an enzyme

(C) Substrates are bound to enzymes by multiple weak attractions

(D) The specificity of binding depends on the precisely defined arrangement of atoms in an active site.

82. Bacteria with engineered abilities to detoxify pollutants are intentionally released for

(A) Bioremediation

(B) Microcosm establishment

(C) Rhizosection

(D) Mibridization

83. Which among the following is not a characteristic feature of an innate immune response ?

(A) Inflammation

(B) Increase of specific antibodies in blood

(C) Increase in phagocytic cells at the site of infection

(D) Activation of complement

84. The first complete gene sequence to be published was

(A) Phage T4

(B) Phage M13

(C) Lambda phage

(D) φ X 174

85. A ____ is a recreation of a portion of an ecosystem in a laboratory.

(A) Mibridization

(B) Microcosm

(C) Rhizosection

(D) biorediation

86. One principal function of complement is to

(A) inactivate perforins

(B) mediate the release of histamine

(C) Bind antibodies attached to cell surfaces and to lyse these cells

(D) phagocytose antigens

87. In humans, the gene for polydactyly (having extra fingers or toes) is dominant over the gene for the normal number of digits. If parents who are both homozygous dominant for polydactyly have four children, how many of these children would most likely have extra fingers or toes ?

(A) 0

(B) 3

(C) 2

(D) 4

88. The power required by an impeller in a gas sparged system compare to the power required by impeller operating at same speed in a gas free liquid is usually

(A) lesser

(B) higher

(C) same

(D) may be lesser or higher depending upon the geometry

89. Edward Jenner developed vaccine procedure against_____.

(A) Hepatits B

(B) Small pox

(C) Hepatits A

(D) Tetanus

90. Most of the secondary metabolite are produced by

(A) *Streptomyces* species

(B) *Staphylococus* species

(C) *Pseudomonas* species

(D) *Clostridium* species

91. Which of the following techniques is similar to a molecular "copy machine" for DNA ?

(A) Polymerase Chain Reaction (PCR)

(B) DNA sequencing

(C) Protein sequencing

(D) Gel electrophoresis

92. What is docking ?

(A) The process by which drugs are fitted into their target binding sites using molecular modelling.

(B) The process by which a lead compound is simplified by removing excess functional groups.

(C) The process by which a pharmacophore is identified.

(D) The process by which two different structures are compared by molecular modelling.

93. How are genes introduced into Dicots ?

(A) Micro injection

(B) Ti Plasmids infection

(C) Electroporation

(D) Particle acceleration

94. Which immunoglobulin has a secretory component ?

(A) IgG

(B) IgA

(C) IgM

(D) Ig D

95. Power number (Np) is also known as

(A) Froude's number

(B) Bond's number

(C) Newton's number

(D) Rayleigh's number

96. In preliminary screening of clones, it is common to use

(A) Antibiotics

(B) Vitamins

(C) Restriction enzymes

(D) Gyrases

97. Semisolid media is used for

(A) isolation of discrete colonies

(B) determination of motility of a culture

(C) determination of viscosity of a culture

(D) subculturing microorganisms

98. The association constant (K_a) at equilibrium is represented by :

(A) [free Ag][free Ab]

(B) [free Ag][free Ab]/[AgAb complex]

(C) [AgAb complex]/[free Ag][free Ab]

(D) [free Ag]/[free Ab]

99. Which of the following can have more than one value ?

(A) The mean

(B) The range

(C) The mode

(D) The median

100. Which of the following techniques is used for separation of cells based on florescence ?

(A) ELISA

(B) Flow cytometry

(C) Immunoelectrophoresis

(D) Agglutination

101. Which out of the following is a substrate-specific enzyme ?

(A) Hexokinase

(B) Thiokinase

(C) Lactase

(D) Decarboxylase

102. If the free energy change (ΔG) in a reaction is a negative value, it indicates that the

(A) reaction releases energy

(B) reaction absorbs energy

(C) reaction is in negative direction

(D) reaction is in positive direction

103. A gram-positive bacterium is stained _____ by the gram stain.

(A) pink

(B) purple

(C) blue

(D) green

104. Human monoclonal antibodies can be obtained by

(A) human hybridomas selected with HT medium

(B) single point mutation of mouse monoclonal antibody

(C) fusing human B-cell with mouse myeloma cells

(D) using transgenic xenomouse strains.

105. During baking, a brown crust develops on the outside of a loaf of bread as the result of

(A) Denaturation

(B) Emulsification.

(C) Coagulation

(D) Dextrinisation

106. NCBI stands for

(A) National Centre for Biology Information

(B) National Centre for Biochemistry Information

(C) National Centre for Biotechnology Information

(D) National Centre for Bioinformatics Information

107. HAT medium is used to :

(A) Select for hybrids in the hybridoma technique

(B) Culture B-lymphocytes

(C) Fuse B-lymphocytes to myeloma cells

(D) Immortalize B-lymphocytes

108. For a binomial distribution, n= 10 & q= 0.6, the mean of the distribution is :

(A) 0.6

(B) 6.0

(C) 10

(D) 4

109. The endogenous antigen is processed by

(A) Endocytic pathway

(B) Cyosolic pathway

(C) Agglutination

(D) Precipitation

110. What was the first human genetic disease that was successfully treated with gene therapy ?

(A) SCID (ADA deficiency)

(B) DOWN syndrome

(C) Cystic Fibrosis

(D) Sickle cell anemia

111. Reverse osmosis' is a form of membrane technology that is used to

(A) change the characteristics of some plant foods

(B) cool pasteurise food.

(C) produce some fruit juices.

(D) improve the characteristics of some baked products.

112. Following test of significance will be used when more than two groups are to be compared

(A) "t" test

(B) Chi-square test

(C) Z-test

(D) Standard error of proportion

113. If we roll three fair dices then the total number of outcomes is :

(A) 6

(B) 36

(C) 216

(D) 1296

114. What hormone is commonly expressed in transgenic livestock to increase their growth and productivity ?

(A) Erythropoietin

(B) Insulin

(C) bGH (bovine growth hormone)

(D) HCG

115. Which of the following food safety issues is a responsibility of state government ?

(A) approving all food safety auditors

(B) inspecting all food premises annually

(C) issuing permits for community markets

(D) developing and updating the Food Standards Code

116. The median of the following data, is : 1,2,4,6,8,10,11,13

(A) 6

(B) 8

(C) 7

(D) 10

117. Which is a protein sequence database among the following ?

(A) GenBank

(B) PSD

(C) PIR

(D) EMBL

118. The first successful transformation of rDNA into a bacterium was carried out by

(A) Watson and Crick

(B) Boyer and Cohen

(C) Nathan, Arber and Smith

(D) Watson and Wilkins

119. The function of Acids in a recipe is to

(A) Thicken mixtures.

(B) act as an activator for yeast.

(C) tenderise the connective tissue in meat and poultry.

(D) Maintain pH

120. Which of the following has been MOST successful for the introduction of DNA into human cells for purposes of gene therapy ?

(A) use of recombinant retroviruses as vectors

(B) Microinjection

(C) Plasmids

(D) Yeast Plasmids

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