1. The term "brackish water" refers to:

   A. Water with high salinity
   B. A mixture of fresh and saltwater
   C. Water in deep-sea trenches
   D. Frozen seawater

2. The depth of an aquaculture pond mainly depends upon-

   A. Species to be cultured
   B. Size of pond
   C. Water quality
   D. None of the above

3. The site is considered as not suitable for coastal aquaculture, if the elevation of the site is above-

   A. Mean higher high water level
   B. Sea bed level
   C. Mean lower low water level
   D. Mean sea level

4. The main seafood export product from India is-

   A. Shrimp
   B. Mussel
   C. Fish
   D. Cephalopods

5. The principal fishing gear employed to catch Bombayduck is-

   A. Trawl net
   B. Gill net
   C. Pole and line
   D. Dol net

6. A fish stock is a-

   A. Management unit
   B. Fisheries unit
   C. Unit of exploitation
   D. Subpopulation of a particular fish species

7. Edible portion of fish contains approximately:

   A. 10-15%
   B. 45-50%
   C. 15-35%
   D. 1-10%

8. Rigor mortis is a phenomenon associated with fish:

   A. Flavour
   B. Colour
   C. Texture
   D. Bone

9. The major storage lipid of fish is:

   A. Cholesterol
   B. Lecithin
   C. Ganglioside
   D. Triglyceride

10. Methods of storing fish in ice are-

   A. Bulking
   B. Shelving
   C. Boxing
   D. All of the above

11. Vaccum-packed seafood is a threat of which bacteria-

   A. Clostridium botulinum
   B. Streptococcus
   C. E.coli
   D. All of the above

12. A mixture of amino acids and peptides obtained after hydrolysis of a protein:

   A. Fish protein concentrate
   B. Fish protein hydrolysate
   C. Chitin
   D. Chitosan

13. Fish meal is rich in which mineral?

   A. Calcium
   B. Iodine
   C. Iron
   D. All of the above

14. Protein fraction responsible for most of the eating attributes in fish meat is –

   A. Myosin
   B. Actin
   C. Paramyosin
   D. Tropomyosin

15. In general, for a small scale fish meal production following method is followed:

A. Wet reduction
B. Dry reduction
C. British process
D. Canadian process

16. Organism responsible for production of high levels of histamine in marine fish:

A. *E.coli*
B. *Salmonella* sp
C. *Morganella maorganii*
D. None of the above

17. Microbial hazards during fish processing can be controlled by the system of-

A. GMP (Good Manufacturing Practices)
B. CCP (Critical Control Point)
C. SSOP (Sanitation Standard Operating Procedures)
D. HACCP (Hazard Analysis and Critical Control Points)

18. Which of the following is a major challenge in aquaculture?

A. Water pollution
B. Limited fish demand
C. Decreasing global temperatures
D. Overproduction of fish stocks

19. What is the primary role of the lateral line system in fish?

A. Detecting vibrations in water
B. Oxygen absorption
C. Digestion
D. Reproduction

20. Instrument for measuring energy value in fish feed is-

A. Bomb calorimeter
B. Respirometer
C. Both A & B
D. None of the above

21. What is the primary use of fishmeal in aquaculture?

A. Fertilizer
B. Animal feed
C. Fuel
D. Medicine

22. Which of the following contributes to ocean acidification?

A. Increased carbon dioxide absorption
B. Oil spills
C. Plastic pollution
D. Overfishing

23. Marine protected areas (MPAs) are designed to:

A. Enhance fish stocks and protect biodiversity
B. Increase oil drilling efficiency
C. Support commercial fishing
D. Reduce marine tourism

24. Toxin responsible for Diarrhetic shellfish poisoning-

A. Domoic acid
B. Brevetoxin
C. Saxitoxin
D. Okadaic acid

25. Spoilage of freshwater fish is generally ascribed to the growth of _____.

A. *Salmonella* sp
B. *Pseudomonas* sp
C. *Vibrio* sp
D. *Shigella* sp.

26. The first step in freshwater aquarium setting after fabrication is:

A. Planting
B. Fixing plants
C. Adding gravels
D. Pouring water

27. Which institute is providing training programme for operating vessel for fishing in the country?

A. CIFNET
B. CIFT
C. NABARD
D. CMFRI

28. Egg layers are popularly known as:

A. Viviparous
B. Ovoviviparous
C. Oviparous
D. None of the above

29. Which marine organism is a major source of omega-3 fatty acids?

A. Seaweed
B. Tuna
C. Clams
D. Coral

30. The exclusive economic zone (EEZ) extends up to how many nautical miles from a country's coastline?

A. 12
B. 24
C. 100
D. 200

31. Family of pearl oysters is-

A. Anomiidae
B. Ostreidae
C. Pteriidae
D. Veneridae

32. Which type of fishing method is known for causing high levels of habitat destruction?

A. Longlining
B. Purse seining
C. Trawling
D. Pole and line fishing

33. What is the major threat to global fisheries?

A. Pollution
B. Overfishing
C. Climate change
D. All of the above

34. The presence of excessive nutrients in water bodies causing harmful algal blooms is known as:

A. Eutrophication
B. Sedimentation
C. Ocean acidification
D. Upwelling

35. Peacock tail is a variety of:

A. Swordtail
B. Platy
C. Gold fish
D. Guppy

36. Air bladder is:

A. Hydrostatic organs of bony fish
B. Excretory organ of fish
C. Excretory organs of mammals
D. Respiratory organs of cephalopods

37. Fish change its direction suddenly by-

A. Pelvic fins
B. Pectoral fins
C. Caudal fins
D. All of the above

38. Most pelagic fish eggs can be found where:

A. Suspended in open water
B. Stagnant water only
C. On the sand at the bottom of the water
D. On the shallow shelves of the coast

39. Most poisonous fish in the world is _____.

A. Common stingray
B. Red Neon
C. Japanese Puffer Fish
D. Deepsea Fish

40. Most powerful electric fish in the world is _____.

A. Northern Pike
B. Electric Catfish
C. Electric Eel
D. Black Torpedo Ray

41. Which of the following is a common method used in fish population assessment?

A. Genetic engineering
B. Sonar surveys
C. Selective breeding
D. Fish tagging

42. Which one of the following is a fish?

A. Sea urchin
B. Sea horse
C. Sea pen
D. Sea lion

43. The exclusive economic zone (EEZ) extends up to how many nautical miles from a country's coastline?

A. 12
B. 24
C. 100
D. 200

44. Which of the following is a major challenge in aquaculture?

A. Water pollution
B. Limited fish demand
C. Decreasing global temperatures
D. Overproduction of fish stocks

45. What is the major environmental concern associated with bottom trawling?

A. Overfishing
B. Destruction of seabed habitats
C. Loss of marine biodiversity
D. All of the above

46. How do marine organisms like corals and shellfish contribute to carbon sequestration?

A. Shell formation
B. Digestion
C. Mating behavior
D. None of the above

47. To eradicate the weeds, weedicides used are:

A. 2,4-D ((2,4-dichlorophen oxyacetic acid)
B. Salt Solution
C. Dilute formalin
D. Potassium permanganate

48. Which marine resource is a key ingredient in biomedical research?

A. Agar from seaweed
B. Deep-sea sand
C. Whale oil
D. Plankton shells

49. What is the main benefit of selective breeding in aquaculture?

A. Improved disease resistance
B. Slower growth rates
C. Increased ocean pollution
D. Reduced biodiversity

50. When a dense marker coverage across the entire genome to capture all the QTL, both large and small, selection is called:

A. LE-MAS
B. LD-MAS
C. GAS
D. Genomic selection

51. Gene assisted selection or GAS is performed when:

A. when marker shows consistent association between genotype and phenotype across the population.
B. when markers shows different linkage phases between markers and QTL from family to family.
C. causative mutation occurs within itself.
D. All of the above

52. In fishes the jaws are adapted for-

A. Manipulating food
B. Defence
C. Grasping
D. All of the above

53. For identification of species through DNA barcoding is being used. However for different domain of life different gene are being preferred. Which of the following is mismatched pair?

A. COI: Animal
B. rbcL & matK: plants
C. 16S rRNA: microbe
D. None of the above

54. DNA barcoding has application in:

A. Identification of taxa & species discovery
B. Ecology and conservation
C. Phylogeography and phylogenetic analysis
D. All of the above

55. The colour of good quality eggs of salmon is:

A. Brown to black
B. Bluish
C. Greenish
D. Orange to red

56. Which of the following is a limitation in case of Morphological identification of a species?

A. Phenotypic plasticity and genetic variability
B. Morphologically cryptic taxa
C. Effective only for a particular life stage or gender
D. All of the above

57. Herbs are supplemented in fish diet in order to:

A. Improve storage
B. Immune enhancement
C. Stability
D. All of the above

58. Which of the following is the attribute of a RIL?

A. are inbred and completely homozygous
B. traits don't segregate further
C. Provide the interaction of a QTL to environment
D. All of the above

59. The practice of breeding, rearing, and harvesting fish in controlled environments is known as:

A. Fisheries science
B. Aquaculture
C. Marine biology
D. Oceanography

60. Which of the following is a major concern in fisheries resource management?

A. Overfishing
B. Habitat restoration
C. Species identification
D. Ocean acidity

61. What is the primary function of gills in fish?

A. Digestion
B. Oxygen exchange
C. Salt excretion
D. Blood circulation

62. Which of the following organisms is commonly used in aquaculture?

A. Tuna
B. Tilapia
C. Swordfish
D. Dolphin

63. The term 'bycatch' in fisheries refers to:

A. Fish raised in captivity
B. Fish unintentionally caught
C. Fish bred for sport fishing
D. Endangered fish populations

64. Coral bleaching is primarily caused by:

A. Overfishing
B. Climate change and rising ocean temperatures
C. Excess nutrients in water
D. Deep-sea mining

65. A major advantage of recirculating aquaculture systems (RAS) is:

A. High water consumption
B. Reduced water usage and controlled environment
C. Increased risk of disease
D. Inefficient fish growth

66. What is the main goal of marine fisheries management?

A. Maximizing fish harvest
B. Ensuring sustainable fish populations
C. Promoting commercial fishing
D. Eliminating fish predators

67. Which is the only anesthetic drug approved by FDA for use on food fish?

A. Benzocaine
B. Tricaine methanesulfonate-(MS-222)
C. Equinol
D. Carbon dioxide

68. Which marine mammal is known for using tools like rocks to open shellfish?

A. Dolphin
B. Sea otter
C. Manatee
D. Seal

69. Which of the following is considered the gold standard in DNA methylation detection?

A. Sanger sequencing
B. Bisulfite sequencing
C. Pyrosequencing
D. All of the above

70. What is the main function of a whale's blubber?

A. Speed
B. Insulation
C. Buoyancy control
D. Protection from predators

71. The first event in translation is the binding of the mRNA to the:

A. Smaller subunit of Ribosome
B. Larger subunit of Ribosome
C. Polysomal core
D. tRNA

72. The thermocline in the ocean is a layer where:

A. Salinity increases
B. Temperature changes rapidly with depth
C. Marine life is absent
D. Oxygen levels are highest

73. The greatest biodiversity in marine ecosystems is found in:

A. Open ocean
B. Coral reefs
C. Polar seas
D. Deep-sea vents

74. Which marine organism is known to be the fastest swimmer?

A. Dolphin
B. Sailfish
C. Shark
D. Orca

75. The Gulf Stream is an example of:

A. A deep-sea trench
B. A warm ocean current
C. A cold upwelling
D. A volcanic ridge

76. Phytoplankton play a crucial role in marine ecosystems because they:

A. Eat smaller fish
B. Consume carbon dioxide and produce oxygen
C. Filter pollution from seawater
D. Protect coral reefs

77. What is the primary diet of baleen whales?

A. Large fish
B. Seals
C. Plankton and krill
D. Seaweed

78. The deepest point in the ocean, located in the Mariana Trench, is called:

A. Challenger Deep
B. Mid-Atlantic Ridge
C. Bermuda Triangle
D. Great Barrier Reef

79. What is the role of fish aggregating devices (FADs) in fisheries?

A. Attracting and concentrating fish
B. Improving fish genetics
C. Monitoring fish diseases
D. Preventing fish migration

80. The fishery method that uses a cone-shaped net dragged through the water is called:

A. Gillnetting
B. Trawling
C. Purse seining
D. Longlining

81. A phylogenetic tree formed using cladistic methods is-

A. Dendrogram
B. Cladogram
C. Phylogram
D. Chronogram

82. Muddy smell in fishes caught from pond is due to-

A. Mud
B. Geosmin
C. Bad water quality
D. All of the above

83. A phylogenetic tree that explicitly represents evolutionary time through its branch spans is a:

A. Dendrogram
B. Cladogram
C. Phylogram
D. Chronogram

84. What is a collection of immunoglobulin molecules that react against a specific antigen, each identifying a different epitope-

A. Monoclonal antibody
B. Polyclonal antibody
C. Hybridoma
D. None

85. Which is the commonly used cryoprotectant for cell line cryopreservation?

A. Glycerol
B. Methanol
C. DMSO
D. Glycerine

86. What is the genome size of zebrafish?

A. 2.4 Gb
B. 1.4 Gb
C. 3 Gb
D. 5 Gb

87. Hela is a cell line derived from:

A. Fish
B. Frog
C. Human
D. Mice

88. Which is a nodal institute that maintains a live gene bank?

A. CIFE, Mumbai
B. NBFGR, Lucknow
C. CMFRI, Cochin
D. CIFA, Bhubaneswar

89. What does MS-222 stand for?

A. Methyl sulphonate tricane
B. Tricane methanesulphonate
C. Tricane methyl sulphonate
D. Tri methane sulphonate

90. What is the main function of gills in fish?

A. Digestion
B. Oxygen exchange
C. Salt excretion
D. Blood circulation

91. The phenomenon where fish produce light through biochemical reactions is called:

A. Bioluminescence
B. Fluorescence
C. Phosphorescence
D. Reflection

92. Which marine biotechnology process uses microorganisms to clean up oil spills-

A. Bioremediation
B. Biofouling
C. Fermentation
D. Bioaccumulation

93. Marine sponges are valuable in biotechnology due to their ability to produce:

A. Industrial plastics
B. Antibiotics and bioactive compounds
C. Heavy metals
D. Radioactive elements

94. What is the main role of a fisheries scientist?

A. Studying the movement of ocean currents
B. Monitoring fish populations and ecosystems
C. Developing underwater robots
D. Constructing ships

95. Which of the following organisms is commonly used in aquaculture?

A. Tuna
B. Tilapia
C. Swordfish
D. Dolphin

96. The most significant benefit of marine protected areas (MPAs) is-

A. Enhancing tourism
B. Increasing fish stocks
C. Reducing coastal erosion
D. Supporting industrial fishing

97. What is bioluminescence commonly used for in marine organisms?

A. Photosynthesis
B. Communication and predation
C. Generating heat
D. Oxygen production

98. What is the primary role of the lateral line system in fish?

A. Detecting vibrations in water
B. Oxygen absorption
C. Digestion
D. Reproduction

99. Which deep-sea hydrothermal vent organisms rely on chemosynthesis instead of photosynthesis for energy?

A. Coral
B. Tube worms
C. Jellyfish
D. Dolphins

100. The term 'mariculture' specifically refers to-

A. Cultivation of marine organisms in open ocean or enclosures
B. Freshwater fish farming
C. Capturing wild fish for breeding
D. Artificial reefs

101. Scientific name for a freshwater pearl from the below:

A. Lamellidens marginalis
B. Perna viridis
C. Pinctata fucata
D. Nine of the above

102. Freshwater Shark is-

A. Mystus vittatus
B. Channa marulius
C. Ompok pabda
D. Wallago attu

103. Which of the following is a true fish?

A. Dog fish
B. Cray fish
C. Cuttle fish
D. Jelly fish

104. Which of the following is not a bony fish?

A. Rohu
B. Cray fish
C. Catla
D. Silver carp

105. Migration from freshwater to marine water is called as:

A. Amphidromous
B. Catadromous
C. Potamodromus
D. Anadromous

106. Which of the following is not a major respiratory organ of fish?

A. Buccopharynx
B. Skin
C. Gill
D. None of the above

107. Red tide is mostly caused by?

A. Bacteria
B. Dinoflagellates
C. Fungi
D. Diatoms

108. Which of the following fish is famous for parental care:

A. Hippocampus
B. Gambusia
C. Scoliodon
D. Labeo

109. Scaleless fish-

A. Cat fish
B. Torpedo
C. Both of the above
D. None of the above

110. Eyes are present on the dorsal surface in which of the following

A. Skates
B. Rays
C. Both A & B
D. Sardine

111. Bioluminescence are found mainly in-

A. Benthic zone
B. Mesopelagic zone
C. Bathypelagic zone
D. All of the above

112. Body fluid of freshwater animals is-

A. Hypertonic
B. Hypotonic
C. Both of the above
D. None of the above

113. Heart in shark is-

A. Venous heart
B. Venous heart or branchial heart
C. Branchial heart
D. None of the above

114. Which of the following is an example of a brackish water ecosystem?

A. Coral reef
B. Mangrove forest
C. Open ocean
D. Freshwater Lake

115. Sea water animals are-

A. Amminotelic
B. Ureotelic
C. Uricotelic
D. None of the above

116. Mussel spawning season is-

A. Spring
B. Late Summers
C. Monsoon
D. All of the above

117. Black pearl is obtained from-

A. P. margaratifera
B. P. Fucata
C. P. maxima
D. P. vulgaris

118. In ponds, algal bloom is predominantly caused by-

A. Spirogyra Species
B. Nitschella Species
C. Microcystis Species
D. Navicula Species

119. Which of the following is known as sanitary fish?

A. Silver carp
B. Grass carp
C. Tilapia
D. Both a & b

120. Which of the following is commonly referred as “Living capsules of nutrition”?

A. Plankton
B. Benthos
C. Nekton
D. None of the above

121. In fishes the blood circulation is called:

A. Double circulation
B. Arterial circulation
C. Venous circulation
D. Arterial and venous circulation

122. Heart pumps only impure blood in case of –

A. Shark
B. Lizard
C. Whale
D. Frog

123. In fishes the teeth are of-

A. Pleurodont type
B. Homodont type
C. Heterododnt type
D. Thecodont type

124. Which of the following Fishes do not drink water?

A. Hag fish (cyclostomes)
B. Shark
C. Sardine
D. None

125. Respiratory pigment in fishes is-

A. Haemoglobin
B. Erythrocyanin
C. Haemocyanin
D. None

126. Purpose of Tagging is:

A. To study the population parameter
B. Growth & Age determination
C. To study the migratory pattern
D. All of the above

127. Which of the following aquatic organisms is a producer?

A. Shark
B. Algae
C. Clam
D. Jellyfish

128. Which of the following marine zones receives the most sunlight?

A. Bathypelagic zone
B. Abyssal zone
C. Epipelagic zone
D. Hadal zone

129. What is the main cause of ocean acidification?

A. Oil spills
B. Increase in carbon dioxide (CO_2) levels
C. Overfishing
D. Rising ocean temperatures

130. Which gas is most responsible for the formation of dead zones in oceans?

A. Oxygen
B. Carbon dioxide
C. Nitrogen
D. Methane

131. What is the primary function of a swim bladder in fish?

A. To help in respiration
B. To maintain buoyancy
C. To store food
D. To protect from predators

132. What type of aquatic ecosystem has the highest biodiversity?

A. Open ocean
B. Coral reefs
C. Deep-sea trenches
D. Freshwater lakes

133. Pyramid of energy in an aquatic ecosystem-

A. May be upright and inverted
B. Always upright
C. Always inverted
D. None of the above

134. Which of these adaptations helps deep-sea fish survive in low-light conditions?

A. Telescopic eyes
B. Small body size
C. Strong fins
D. Thick scales

135. Excretory products of fishes are:

A. Ammonia
B. Urea
C. Both A & B
D. None of the above

136. Protein peptide bonds have a partial double bond nature because of:

A. The resonance between the nitrogen and the carbonyl group.
B. The existence of a nitrogen amide.
C. The robust hydrogen bonds that peptide groups form.
D. Sulfur atoms found in cysteine residues

137. Which of the following enzymes catalyzes the first step of glycolysis, converting glucose to glucose-6-phosphate?

A. Hexokinase
B. Phosphofructokinase-1
C. Pyruvate kinase
D. Glucokinase

138. Which of the following interactions is responsible for the stabilization of alpha-helix in protein structure?

A. Ionic bonds
B. Hydrogen bonds
C. Van der Waals forces
E. Disulfide bridges

139. Which of the following statements best describes the role of NADH in cellular respiration?

A. NADH is oxidized during glycolysis to generate ATP.
B. NADH transfers electrons to the electron transport chain.
C. NADH is a direct donor of phosphate groups in oxidative phosphorylation.
D. NADH reduces glucose to form pyruvate.

140. In the urea cycle, which compound combines with ammonia to form carbamoyl phosphate?

A. Citrulline
B. Glutamate
C. Acetyl-CoA
D. Bicarbonate

141. In the case of Phenylketonuria (PKU), which of the following enzymes is deficient?

A. Phenylalanine hydroxylase
B. Tyrosine hydroxylase
C. Dihydropteridine reductase
D. Phenylalanine dehydrogenase

142. In fatty acid oxidation, the process of beta-oxidation occurs in which part of the eukaryotic cell?

A. Cytoplasm
B. Mitochondria
C. Endoplasmic reticulum
D. Nucleus

143. In the pentose phosphate pathway, the key enzyme that generates NADPH is:

A. Glucose-6-phosphate dehydrogenase
B. Hexokinase
C. Phosphofructokinase-1
D. Pyruvate kinase

144. The primary function of glycoproteins and glycolipids in the cell membrane is to:

A. Serve as channels for ions and molecules.
B. Form the structural backbone of the membrane.
C. Facilitate cell recognition and communication.
D. Provide energy for membrane transport.

145. The fluid mosaic model of biological membranes suggests that:

A. The membrane is a rigid structure.
B. Lipids and proteins are fixed in position within the membrane.
C. Lipids and proteins can move laterally within the membrane.
D. Proteins are absent in biological membranes.

146. Which of the following membrane proteins is involved in active transport?

A. G-protein-coupled receptor (GPCR)
B. Ion channels
C. Sodium-potassium pump (Na+/K+ ATPase)
D. Receptor tyrosine kinases (RTKs)

147. The enzyme phosphofructokinase-1 (PFK-1) regulates the flux of metabolites through which pathway?

A. Glycolysis
B. The citric acid cycle
C. Gluconeogenesis
D. Pentose phosphate pathway

148. How does the binding of oxygen to hemoglobin affect its affinity for additional oxygen molecules?

A. It decreases the affinity for more oxygen molecules.
B. It increases the affinity for more oxygen molecules.
C. It has no effect on the affinity for oxygen.
D. It causes hemoglobin to release all bound oxygen.

149. Which of the following processes generates the most ATP during cellular metabolism?

A. Glycolysis
B. Citric acid cycle
C. Fatty acid oxidation
D. Oxidative phosphorylation

150. Which cofactor is required for the decarboxylation of alpha-ketoglutarate in the citric acid cycle?

A. NAD+
B. FAD
C. Coenzyme A
D. TPP (Thiamine pyrophosphate)

151. Which disease has a malfunction in the enzyme that turns glycogen into glucose-6-phosphate?

A. Glycogen storage disease type I (Von Gierke disease)
B. Phenylketonuria
C. Tay-Sachs disease
D. Alkaptonuria

152. In Gaucher disease, a deficiency of which enzyme leads to the accumulation of glucocerebroside in tissues?

A. Glucocerebrosidase
B. Hexosaminidase A
C. Sphingomyelinase
D. Galactocerebrosidase

153. Which of the following is true regarding the Ramachandran plot?

A. It shows the allowed angles for the peptide bond in a protein.
B. It provides a plot of the alpha-helix structure.
C. It helps determine the protein's secondary structure.
D. Both A and C.

154. In the process of oxidative phosphorylation, the proton gradient created by the electron transport chain is used to:

A. Drive the formation of ATP from ADP and Pi via ATP synthase.
B. Directly reduce oxygen to water.
C. Synthesize glucose from pyruvate.
D. Synthesize NADH from NAD+.

155. The Michaelis-Menten constant (Km) represents the concentration of substrate at which:

A. The reaction velocity is half of its maximum value.
B. The enzyme is saturated with substrate.
C. The enzyme reaches its maximum catalytic efficiency.
D. The reaction velocity reaches its maximum value.

156. In the structure of hemoglobin, what effect does the binding of oxygen to one subunit have on the other subunits?

A. It decreases the affinity of the other subunits for oxygen.
B. It increases the affinity of the other subunits for oxygen.
C. It does not affect the other subunits.
D. It causes a conformational change that decreases the oxygen binding capacity of hemoglobin.

157. In the Michaelis-Menten plot, what does the Vmax represent?

A. The rate at which the substrate is converted to product when the enzyme is saturated with substrate.
B. The substrate concentration at which the reaction rate is half of the maximum.
C. The concentration of the enzyme-substrate complex.
D. The rate of the reaction at low substrate concentrations.

158. The following rate equation represents _____ inhibition.
$V=V_{max}[S]/ K_m(1+I / K_i)+[S]$

A. Competitive
B. Mixed
C. Non-competitive
D. Uncompetitive

159. What does the Michaelis-Menten constant (Km) represent?

A. The maximum velocity of the enzyme reaction
B. The concentration of substrate at half-maximal velocity
C. The rate of the enzyme-catalyzed reaction
D. The concentration of enzyme required for the reaction

160. Which of the following amino acids is least likely to be found in the interior of a water-soluble globular protein?

A. Serine
B. Glutamate
C. Alanine
D. Leucine

161. Which of the following is a feature distinguishing a reducing sugar from a non-reducing sugar?

A. The presence of a free aldehyde or ketone group.
B. The ability to form a cyclic structure.
C. The presence of a phosphate group.
D. The ability to undergo condensation with alcohols.

162. Which of the following statements about purines and pyrimidines is correct?

A. Purines have two fused rings, while pyrimidines have a single six-membered ring.
B. Pyrimidines are composed of a purine base plus a sugar, while purines are composed of a pyrimidine base plus a sugar.
C. Pyrimidines pair with adenine in DNA, while purines pair with guanine.
D. Purines include uracil and thymine, while pyrimidines include adenine and guanine.

163. UV light induces mutations in DNA primarily by causing which of the following?

A. Hydrolytic deamination of purine bases.
B. Formation of thymine dimers between adjacent pyrimidine bases.
C. Introduction of double-strand breaks in the DNA.
D. Base-pair mismatches due to errors during replication.

164. In size exclusion chromatography (SEC), the separation of molecules is primarily based on which of the following?

A. The affinity of molecules for a specific ligand.
B. The hydrophobicity of molecules.
C. The molecular size of the analytes.
D. The charge of the molecules.

165. What is the principle behind the technique of affinity chromatography?

A. Separation is based on differences in the size and shape of the molecules.
B. Separation occurs by exploiting differences in molecular charge.
C. Molecules are separated based on their ability to bind to a specific ligand immobilized on the stationary phase.
D. Molecules are separated by their solubility in the mobile phase.

166. In a vertical gel electrophoresis system, what is the primary reason for using a stacking gel?

A. To increase the resolution of large proteins.
B. To concentrate the sample into a narrow band before it enters the separating gel.
C. To slow down the migration of large proteins.
D. To buffer the electric current and prevent overheating of the system.

167. In SDS-PAGE (Sodium Dodecyl Sulfate - Polyacrylamide Gel Electrophoresis), what is the primary purpose of using SDS?

A. To stain proteins for visualization.
B. To denature proteins and impart a negative charge to them.
C. To bind to proteins and prevent aggregation.
D. To stabilize the pH of the gel during electrophoresis.

168. The discovery of the structure of DNA in 1953 by James Watson and Francis Crick was heavily influenced by the work of which key scientist who took X-ray diffraction images of DNA?

A. Rosalind Franklin
B. Linus Pauling
C. Frederick Sanger
D. Paul Berg

169. Which of the following is the main product of the Calvin Cycle that is subsequently used in the biosynthesis of carbohydrates during photosynthesis?

A. ATP
B. NADPH
C. G3P (Glyceraldehyde-3-phosphate)
D. Oxygen

170. In the purine biosynthesis pathway, which of the following is the first committed step in the formation of the purine ring structure?

A. Formation of inosine monophosphate (IMP) from xanthosine monophosphate (XMP).
B. Conversion of ribose-5-phosphate to PRPP (phosphoribosyl pyrophosphate).
C. Conversion of IMP to AMP and GMP.
D. Formation of 5-phosphoribosylamine from PRPP.

171. Which of the following is the correct function of snRNPs (small nuclear ribonucleoproteins) in eukaryotic cells**?**

A. They are involved in the splicing of pre-mRNA
B. They act as enhancers in transcription
C. They assist in the transport of mRNA out of the nucleus
D. They degrade misfolded proteins in the cytoplasm

172. The function of the sigma (σ) factor in bacterial transcription is:

A. To terminate transcription
B. To synthesize the RNA strand
C. To initiate transcription by recognizing promoter sequences
D. To splice introns out of the primary RNA transcript

173. In plant biotechnology, the primary advantage of using *Agrobacterium tumefaciens* for genetic transformation is:

A. It transfers DNA into plant cells via electroporation.
B. It introduces foreign genes into plant genomes with a high frequency of integration.
C. It exclusively transforms monocot plants.
D. It naturally forms tumors, which enhance growth in genetically modified plants.

174. What is a major limitation of the CRISPR/Cas9 system?

A. Inability to create double-strand breaks
B. Off-target mutations
C. Lack of donor DNA requirement
D. Inefficiency in eukaryotes

175. What determines the specificity of RNAi in gene silencing?

A. Sequence homology
B. 5’ cap structure
C. mRNA secondary structure
D. siRNA binding location

176. Which of the following is a primary challenge in whole-genome sequencing of eukaryotic genomes?

A. High AT-content
B. Large intronic regions
C. Lack of repetitive sequences
D. Absence of coding sequences

177. In fed-batch culture, why is the substrate added periodically?

A. To avoid substrate inhibition
B. To maximize cell growth
C. To maintain product stability
D. To prevent contamination

178. Which of the following components is NOT involved in eukaryotic mRNA splicing?

A. U1 snRNP
B. U2 snRNP

C. Polyadenylation signal
D. Branch point A residue

179. What advantage does Whole Genome Sequencing (WGS) have over 16S rRNA sequencing in metagenomics?

A. Provides species and functional genes
B. Less biased in detecting rare taxa
C. Faster and cheaper
D. Species-level resolution only

180. In the production of recombinant proteins in Escherichia coli, inclusion bodies often form. What is the primary cause of inclusion body formation?

A. Excessive glycosylation of proteins
B. Misfolding of proteins due to overexpression
C. Lack of ribosome recycling during translation
D. Incorrect splicing of mRNA transcripts

181. Which of the following is TRUE regarding the role of microRNAs (miRNAs) in gene regulation?

A. miRNAs inhibit translation by binding to complementary sequences in the 5' UTR of target mRNAs
B. miRNAs degrade mRNAs by recruiting the RNA-induced silencing complex (RISC)
C. miRNAs activate the transcription of target genes
D. miRNAs stabilize mRNAs and increase their half-life

182. What is the most significant challenge in using stem cells for regenerative medicine?

A. Lack of differentiation capacity
B. Immune rejection after transplantation
C. High proliferation rates in vivo
D. Inability to express growth factors

183. What is the primary function of telomerase in eukaryotic cells?

A. Repair of DNA double-strand breaks
B. Extension of telomeres during replication
C. Regulation of gene expression
D. Facilitation of mRNA splicing

184. Which method is widely used for the production of monoclonal antibodies?

A. CRISPR/Cas9
B. Phage display
C. Hybridoma technology
D. Recombinant DNA technology

185. Which component of the ribosome is primarily responsible for catalyzing peptide bond formation during translation?

A. Small ribosomal subunit
B. Large ribosomal subunit
C. rRNA
D. tRNA

186. When cloning large fragments of DNA using bacterial artificial chromosomes (BACs), what is the primary advantage over traditional plasmids?

A. Faster replication in bacterial cells
B. Ability to clone larger DNA fragments
C. Lower mutation rate during replication
D. Greater compatibility with viral promoters

187. Which of the following approaches in bioreactor design is used to improve oxygen transfer in large-scale microbial fermentations for aerobic organisms?

A. Using bubble columns
B. Increasing the height-to-diameter ratio of the bioreactor
C. Utilizing gas-permeable membranes
D. Implementing mechanical stirrers with high agitation rates

188. The lac operon in *E. coli* is an example of:

A. Negative inducible regulation
B. Negative repressible regulation
C. Positive inducible regulation
D. Positive repressible regulation

189. What is the key feature of a metagenome study?

A. Sequencing individual organisms' genomes
B. Sequencing of uncultured microbial communities
C. Use of restriction enzymes for analysis
D. Isolation of DNA from eukaryotic cells only

190. In metabolic engineering, one of the major challenges is the accumulation of metabolic intermediates, which can lead to a bottleneck in the desired product formation. Which of the following strategies can effectively address this issue?

A. Overexpression of enzymes upstream of the bottleneck
B. Knockout of pathways leading to undesired byproducts
C. Introducing an alternative pathway for the desired product
D. Optimization of co-factor regeneration for rate-limiting enzymes

191. During cell division, which protein complex is responsible for holding sister chromatids together until anaphase?

A. Cohesin
B. Condensin
C. Kinetochore
D. Separase

192. In gene therapy for treating recessive genetic disorders, why is the use of ex vivo approaches generally preferred over in vivo approaches?

A. Higher efficiency of gene delivery
B. Lower risk of immune rejection
C. Better control over gene insertion sites
D. More stable expression of the therapeutic gene

193. In the blue-white screening method used for recombinant DNA cloning, what is the primary function of the lacZ gene?

A. To encode the enzyme β-galactosidase for selection of recombinant colonies
B. To serve as a selectable marker for antibiotic resistance
C. To provide a fluorescent signal for detection of clones
D. To inhibit growth of non-recombinant bacteria

194. Which of the following is true about cell signaling via receptor tyrosine kinases (RTKs)?

A. RTKs bind ligands that are primarily lipophilic molecules like steroids.
B. RTK activation leads to autophosphorylation on tyrosine residues.
C. RTKs signal exclusively through G-proteins.
D. RTKs are primarily involved in the regulation of apoptosis.

195. During transcription in eukaryotes, what is the role of the TATA-binding protein (TBP)?

A. Unwinding the DNA double helix
B. Recruiting RNA polymerase II to the promoter
C. Catalyzing RNA synthesis
D. Capping the 5' end of mRNA

196. Which of the following techniques is used for transferring DNA into plant cells?

A. Electroporation
B. Agrobacterium-mediated transformation

C. Microinjection
D. Liposome-mediated transfection

197. In eukaryotes, which regulatory element is responsible for enhancing the rate of transcription from a distance?

A. Promoter
B. Enhancer
C. Operator
D. Repressor

198. Which protein plays a critical role in loading DNA polymerase onto the DNA during replication in eukaryotes?

A. DNA primase
B. Helicase
C. Sliding clamp
D. Single-strand binding protein

199. In the lac operon, what is the effect of high lactose levels in the presence of low glucose?

A. Repressor binds to the operator
B. CAP-cAMP complex binds to the promoter
C. RNA polymerase is inhibited
D. Transcription of the lac operon is blocked

200. Which of the following methods is most effective for achieving gene knockdown in eukaryotic cells without permanent gene editing?

A. TALENs
B. RNA interference (RNAi)
C. Zinc-finger nucleases
D. CRISPR/Cas9

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