



Gujarat Biotechnology Research Centre

Environmental BT

This question booklet contains 32 pages

Application No: _____

Time: 2 Hours

Total Marks: 200

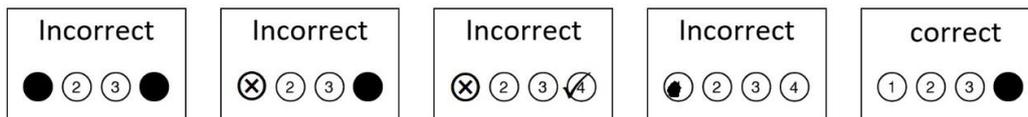
Total Questions: 200

Invigilator Signature :

Candidate Signature :

Instructions for Candidate

1. This question booklet contains 200 questions.
2. Each correct answer carries 1 mark.
3. Every attempted question with incorrect answer shall carry a negative mark of 0.25.
4. Use only Black Ball Point Pen to darken the appropriate circle in OMR.
5. Please darken the complete circle.
6. Darken ONLY ONE CIRCLE for each Question as shown below:



7. Answer once marked cannot be changed.
8. Please do not make any stray marks on the Question Booklet.
9. Rough works must be done on the blank page of Question Booklet.
10. Mark your answer in the appropriate space in the Answer Sheet against the Number corresponding to the question.
11. The Candidate has to submit Question booklet and OMR response sheet to the invigilator on conclusion of examination.

- 1 A population of cells derived from a single cell are called
 - (A) Monoclonal cells
 - (B) Clones
 - (C) Protoplasts
 - (D) Sub culture

- 2 Culture medium used for fungus is
 - (A) Sabouraud's medium
 - (B) Nutrient agar
 - (C) Nutrient broth
 - (D) Minimal agar medium

- 3 A cell becomes flaccid when placed in a
 - (A) Isotonic solution
 - (B) Hypertonic solution
 - (C) Hypotonic solution
 - (D) Normal solution

- 4 Rapid bacterial growth phase is known as
 - (A) Log
 - (B) Lag
 - (C) Lack
 - (D) Exponential phase

- 5 Vaccines prepared from toxins and chemicals are
 - (A) Cellular vaccines
 - (B) Sub-cellular vaccines
 - (C) Attenuated vaccines
 - (D) Heterologous vaccines

- 6 Which of the following involves the formation of nitrate from ammonia?
 - (A) Ammonification
 - (B) Denitrification
 - (C) Nitrification
 - (D) Nitrogen fixation

- 7 DNA from the host sample can be amplified by a process known as the Polymerase Chain Reaction (PCR). Which of the following is required for PCR?
 - (A) Knowledge of the genetic sequence to be amplified
 - (B) A single nucleotide primer
 - (C) A universal probe to detect the amplified product
 - (D) A host sensitive DNA polymerase enzyme

- 8 Zooplankton that spend only a portion of their lives as plankton are called
 - (A) Holoplankton
 - (B) Meroplankton
 - (C) Benthoplankton
 - (D) Hemiplankton

- 9 In the biological treatment of waste, bacteria such as species of Actinobacteria and Zoogloea are considered to play a key role in floc formation
- (A) By the synthesis and secretion of polysaccharides
 - (B) Since they are acid producers
 - (C) As they are slow growing methanogens
 - (D) Since they break down acetic acid into methane and CO₂
- 10 Solid state fermentation (SSF's) involve solid substrates at low moisture levels or water activities where
- (A) The water content is >95%
 - (B) The water content is between 40-80%,
 - (C) The water content is between 4-8%
 - (D) The water content is 10%
- 11 A man who is affected with Hemophilia A, married a woman who is a carrier of this disorder. What proportion among the following of this couple's daughters will be affected and what proportion of the daughters will be carriers?
- (A) 0.75 : 0.25
 - (B) 0.25 : 0.75
 - (C) 00 : 01
 - (D) 0.5 : 0.5
- 12 Ballast water is a serious issue due to possibility of
- (A) Induction of polluted water from one site to another site
 - (B) Introduction of marine alien invasive species
 - (C) Release of water from the ship leading to severe upwelling, causing destruction in ocean currents
 - (D) Several ship anchored near the harbour causing transient localized depletion of water due to uptake of seawater after offloading cargo
- 13 An enzyme of 40 kDa is added to a substrate solution in a molar ratio of 1:3. The concentration of the enzyme in the mixture is 12 mg/ml. What would be the corresponding substrate concentration?
- (A) 0.4mM
 - (B) 0.12mM
 - (C) 0.9mM
 - (D) 0.3mM
- 14 The aflatoxin found in post-harvested grains is injurious to health due to
- (A) Aspergillus
 - (B) Alternaria
 - (C) Fusarium
 - (D) Phytophthora
- 15 When garlic is cut or processed, the crushed garlic odour is due to the formation of
- (A) Diacetyl
 - (B) Diallyl disulfide
 - (C) Ethyl butyrate
 - (D) Benzaldehyde

- 16 To which one of the following groups, the antibiotics kanamycin, streptomycin and gentamicin belongs
- (A) cephalosporins
 - (B) macrolides
 - (C) aminoglycosides
 - (D) quinolones
- 17 How much skim milk (in kg) containing 0.1% fat should be added to 500 kg of cream containing 50% fat to produce standardized cream containing 36% fat?
- (A) 140
 - (B) 165
 - (C) 195
 - (D) 210
- 18 Biofilm produced by bacteria is detected by
- (A) Safranin
 - (B) Malachite green
 - (C) Basic fuchsin
 - (D) Congo red
- 19 Detoxification of alcohol occurs in liver cells where peroxisomal enzymes remove hydrogen from it, which is
- (A) combined with water molecules to generate hydrogen peroxide
 - (B) used to break down hydrogen peroxide
 - (C) transferred to the mitochondria
 - (D) transferred to oxygen molecules to generate hydrogen peroxide
- 20 When DNA is extracted from bacterial cells and analysed for base composition, it is found that 38% of bases are Cytosine (C). What percentage of bases is Adenine (A)?
- (A) 12
 - (B) 24
 - (C) 38
 - (D) 62
- 21 The spectroscopic method for detection of functional group is:
- (A) CD spectroscopy
 - (B) FTIR spectroscopy
 - (C) ESR spectroscopy
 - (D) UV-Visible spectroscopy
- 22 To prepare a DNA probe of high specific activity for detecting a single copy of gene in a Zoo-blot experiment, which one of the following procedures would be performed?
- (A) 5'end levelling
 - (B) 3'end levelling
 - (C) In vitro transcription
 - (D) Random prime labelling
- 23 Pyrosequencing derives its name from the fact that:
- (A) the bases are detected by pyrolysis
 - (B) It detects pyrophosphate released during base incorporation
 - (C) it uses apyrase to detect the bases
 - (D) it generate a pyrogram as an output

- 24 Which one of the following mineral deficiency will first be visible in younger leaves?
(A) calcium
(B) nitrogen
(C) zinc
(D) molybdenum
- 25 As per the cladistic taxonomy, Archosaurs are a group of diapsid amniotes which include extinct dinosaurs. The living representative of the group consist of
(A) Anurans and Aves
(B) Aves and Crocodyle
(C) Aves and agnatha
(D) Osteichthyes and Squamata
- 26 If you want to divide a human body into dorsal and ventral sections, what plane will you use?
(A) Coronal
(B) Abdominopelvic
(C) Transverse
(D) Sagittal
- 27 In order to check whether a protein has been phosphorylated during treatment with a drug, you may perform
(A) Southern hybridization
(B) Western blot analysis
(C) ChIP assay
(D) RFLP
- 28 Which one of the following statement is NOT correct?
(A) Herbivores enhance the productivity of a productive ecosystem and reduce the productivity of a non productive ecosystem
(B) Detritus based foodchains are longer in more productive ecosystem
(C) Consumption efficiency of herbivores is higher in grassland than ocean
(D) Production efficiency of carnivores is higher than herbivores
- 29 The molar fraction of hydrochloride acid in an extremely dilute aqueous solution is doubled. The pH of the resulting solution is
(A) approximately doubled
(B) approximately halved
(C) increased
(D) reduced
- 30 What is the effect of sudden increase in the levels of ATP and citrate on an erythrocyte undergoing glycolysis?
(A) It inhibits glycolysis
(B) It stimulates glycolysis
(C) The rate of glycolysis remains unaltered
(D) The rate of glycolysis increases gradually

- 31 During eukaryotic cell division, metaphase to anaphase transition is regulated by degradation of
- (A) Cyclin B1
 - (B) CDK1
 - (C) Aurora A kinase
 - (D) Polo-like kinase
- 32 Entry of enveloped viruses into its host cells is mediated by
- (A) Only endocytosis
 - (B) Both endocytosis and phagocytosis
 - (C) Both endocytosis and membrane fusion
 - (D) Only pinocytosis
- 33 Insulin increases facilitated diffusion of glucose in muscle cells by:-
- (A) phosphorylation of glucose transporters
 - (B) translocation of glucose transporter containing endosomes into the cell membrane
 - (C) inhibition of the synthesis of mRNA for glucose transporters
 - (D) dephosphorylation of glucose transporters
- 34 During which of the following major mass extinction events, over 95% of the marine species disappeared from the planet Earth?
- (A) Ordovician
 - (B) Devonian
 - (C) Permian
 - (D) Triassic
- 35 In which ecosystem is the autotroph-fixed energy likely to reach the primary carnivore level in the shortest time?
- (A) Temperate deciduous forest
 - (B) Grassland
 - (C) Ocean
 - (D) Tropical rain forest
- 36 Which of the following is NOT an attribute of a species that makes it vulnerable to extinction?
- (A) Specialized diet
 - (B) Low dispersal ability
 - (C) Low trophic status
 - (D) Variable population density
- 37 Which one of the following can be analysed using Surface Plasmon Resonance method?
- (A) Radiolabelled DNA probes.
 - (B) Protein structure
 - (C) Optical density of a solution
 - (D) Label-free biomolecular interaction
- 38 If you remove a set of cells from an early embryo, you observe that the adult organism lacks the structure that would have been produced from those cells. Therefore, the organism seems to have undergone
- (A) autonomous specification
 - (B) conditional specification
 - (C) morphogenic specification
 - (D) syncytial specification

- 39 A researcher wants to obtain complete chemical information, i.e., head groups and fatty acids of phospholipids from liver tissues. Phospholipids have fatty acids of different lengths and unsaturation and also the head groups are of different chemistries.
- (A) Only thin layer chromatography (TLC)
 - (B) TLC and gas chromatography
 - (C) Paper and thin layer chromatography
 - (D) Only paper chromatography
- 40 A river is 4.1 km wide. A bridge built across it has $\frac{1}{7}$ of its length on one bank and $\frac{1}{8}$ of its length on the other bank. What is the total length of the bridge?
- (A) 5.1 km
 - (B) 4.9 km
 - (C) 5.6 km
 - (D) 5.4 km
- 41 Serum has essentially the same composition as plasma EXCEPT that it lacks
- (A) Albumin
 - (B) Stuart-Prower factor
 - (C) Antihemophilic factor
 - (D) Hageman factor
- 42 Which of the following mutagens is most likely to result in a single amino acid change in a gene product?
- (A) Acridine orange
 - (B) X-rays
 - (C) Ethylmethane sulphonate (EMS)
 - (D) Ethidium bromide
- 43 Individuals occupying a particular habitat and adapted to it phenotypically but not genotypically are known as
- (A) Ecophenes
 - (B) Ecotypes
 - (C) Ecospecies
 - (D) Coenospecies
- 44 Which one of the following analytical techniques does NOT involve an optical measurement?
- (A) ELISA
 - (B) Microarray
 - (C) Flow cytometry
 - (D) Differential Scanning Calorimetry
- 45 An optical measurement of a protein is taken both before and after digestion of the protein by a protease. In which of the following spectroscopic measurements the signal change, i.e., before vs after protease treatment, could be the maximum?
- (A) Absorbance at 280 nm
 - (B) Circular dichroism
 - (C) Absorbance at 340 nm
 - (D) Fluorescence value

- 46 Addition of the antibiotic cephalixin to growing *E. coli* cells lead to filamentation of the cells, followed by lysis. Cephalixin is an inhibitor of
- (A) protein synthesis
 - (B) DNA synthesis
 - (C) peptidoglycan synthesis
 - (D) RNA polymerase
- 47 When bacteria growing at 20°C are warmed at 37°C, they are most likely to synthesize membrane lipid with more
- (A) short chain saturated fatty acids
 - (B) short chain unsaturated fatty acids
 - (C) long chain saturated fatty acids
 - (D) long chain unsaturated fatty acids
- 48 Which of the following is likely to contribute to the stability of an ecosystem?
- (A) High number of specialists
 - (B) Fewer number of functional links
 - (C) more omnivores
 - (D) Linear rather than reticulate food webs
- 49 If the milk is left open, lactose is fermented first to produce acid. This is followed by proteolytic bacteria which increases the pH. Ultimately milk fats are degraded to produce rancidity. This is an example of
- (A) ecological succession
 - (B) antagonism
 - (C) interference competition
 - (D) microevolution
- 50 An elephant is considered to have a slow life-history pattern. Which of those characteristics would be matched to an elephant?
- (A) unstable environment
 - (B) long life span
 - (C) reproduce early
 - (D) mature quickly
- 51 A blue whale stranded on a beach will suffocate because
- (A) it need to breath water
 - (B) its evaginated gills will dry out
 - (C) it will not be able to contract its diaphragm
 - (D) it will get air bubble in its blood stream
- 52 The maximum water pollution is caused by
- (A) detergent
 - (B) pesticides
 - (C) industrial waste
 - (D) ammonia
- 53 On average how much plant biomass is removed by terrestrial herbivores?
- (A) 10%
 - (B) 18%
 - (C) 30%
 - (D) 51%

- 54 Due to global warming, species of plants and animals can generally be expected to migrate from
- (A) higher altitudes to lower altitudes
 - (B) lower altitudes to higher altitudes
 - (C) west to east along a given latitude
 - (D) east to west along a given latitude
- 55 Under which scenario two species could co-exist in same niche violating the Gauss exclusion principle
- (A) high predator pressure or diseases
 - (B) limited food availability
 - (C) limited space
 - (D) functioning under same environment gradients
- 56 When exposed to a cold environment for several weeks, many small mammals dramatically increase their capacity for heat production primarily by means of
- (A) decreased insulation
 - (B) increased insulation
 - (C) shivering thermogenesis
 - (D) non-shivering thermogenesis
- 57 Which of these equation represents zero population growth?
- (A) Birth rate-Death rate = 0
 - (B) Birth rate-Death rate > 0
 - (C) Birth rate+ Death rate < 0
 - (D) Birth rate + Death rate = 0
- 58 The E-value in a BLAST search measures
- (A) the probability that the search result is non-random
 - (B) the significance of the search result
 - (C) the probability that the search result is obtained randomly
 - (D) the reliability of the search
- 59 In a gel filtration chromatography
- (A) the large protein will be eluted first
 - (B) the small protein will be eluted first
 - (C) both the large and small will be eluted at the same time
 - (D) the small protein with high charge will be eluted first
- 60 Which of the following techniques can not be used to determine the molecular weight of a protein?
- (A) UV adsorption
 - (B) viscosity
 - (C) light scattering
 - (D) sedimentation equilibrium
- 61 The reason for using Taq polymerase for PCR is that
- (A) it is heat stable and can withstand the temperature change of the cyclers
 - (B) only minute amounts are needed for each cycle of PCR
 - (C) it binds more rapidly than other polymerase to primer
 - (D) it has regions that are complementary to primers

- 62 DNA technology has many medical applications. Which of the following is not done routinely at present?
- (A) production of hormones for treating diabetes
 - (B) production of microbes that can metabolize toxin
 - (C) introduction of genetically engineered genes into human gametes
 - (D) prenatal identification of genetic disease alleles
- 63 In recombinant DNA methods, the term vector can refer to
- (A) the enzyme that cuts DNA in restriction fragments
 - (B) the sticky end of a DNA fragment
 - (C) a SNP marker
 - (D) a plasmid used to transfer DNA into a living cell
- 64 The major difference between transgenic mice and knockout mice is that
- (A) transgenic mice always employ the use of cloned genes derived from other species
 - (B) transgenic mice have foreign genes that integrate at targeted loci through homologous recombination
 - (C) transgenic mice have a functional foreign gene added to their genome
 - (D) knockout mice always have a unique phenotype
- 65 Protein-DNA interactions in vivo can be studied by
- (A) gene duplication from a common ancestor
 - (B) southern hybridization
 - (C) chromatin immunoprecipitation assay
 - (D) fluorescence in situ hybridization assay
- 66 Hemophilia A, a common X-linked bleeding disorder is caused due to lack of function of a gene for:
- (A) Factor VIII
 - (B) Factor VII
 - (C) Platelets
 - (D) Fibrinogen
- 67 If a man of blood group AB marries to woman of blood group A whose father was blood group O, to what different blood groups can this man and woman expect their children to belong?
- (A) A, AB, B
 - (B) A, AB
 - (C) AB, O
 - (D) A,O,B
- 68 Bacterial cell with two copies of same genes, one on the bacterial chromosome and one on the newly introduced F plasmid are termed as
- (A) Mesozygotes
 - (B) Diploid
 - (C) Merozygotes
 - (D) Sex duction
- 69 Why did Mendel continue some of his experiments to F2 or F3 generation?
- (A) to obtain a larger number of offspring on which to base statistics
 - (B) to observe whether or not a recessive trait would reappear
 - (C) to observe whether or not the dominant trait would reappear
 - (D) to distinguish which alleles were segregating

- 70 Which of the following produces a Mendelian pattern of inheritance?
(A) genomic imprinting
(B) a mitochondrial gene mutation
(C) a chloroplast gene mutation
(D) a trait acted upon by many genes
- 71 Among the following antigens specific to a pathogen, which one is most likely to be ineligible as a vaccine with long lasting host protecting effect?
(A) a cell surface protein
(B) an enzyme involved in pathogen metabolism
(C) a signaling intermediate, which is a kinase
(D) a long chain fatty acid
- 72 Which of the following statements best describe archaebacteria?
(A) Mostly autotrophic, cell wall contains peptidoglycan, 60S ribosomes, live in extreme environment
(B) Divide by fission, not susceptible to lysozyme, live in extreme environments, mostly autotrophic
(C) Not susceptible to lysozyme, contain golgiand linear chromosomes
(D) Chitinous cell wall, obligate aerobic, circular chromosome
- 73 Which of the following microbial fermentation are anaerobic?
(A) ethanol and acetone-butanol
(B) citric acid and propionic acid
(C) penicillin and vitamin B12
(D) streptomycin and rifampicin
- 74 For developing transgenic mice, embryonic stem cells are engineered to express the transgene. These cells are selected by
(A) novobiocin
(B) neomycin
(C) tetracycline
(D) penicillin
- 75 Routinely used glucose biosensor estimates blood glucose level by sensing the concentration of
(A) glucose
(B) oxygen
(C) carbon di oxide
(D) hydrogen peroxide
- 76 A plot of soil contaminated with diesel oil was inoculated with oyster mushrooms. After 4 weeks, more than 95% of the polycyclic aromatic hydrocarbons had been reduced to non-toxic compounds. This process is called
(A) biostimulation
(B) chemiremediation
(C) mycoremediation
(D) zooremediation

- 77 Ribosomes were isolated from bacteria grown in a heavy medium (^{13}C and ^{15}N) and from bacteria grown in a light medium (^{12}C and ^{14}N). These ribosomes were added to an in-vitro system actively engaged in protein synthesis. An aliquot removed several hours later was analyzed by density gradient centrifugation. How many bands of 70S ribosomes would you expect to see in the density gradient?
- (A) 2
 - (B) 4
 - (C) 6
 - (D) 8
- 78 What would be the best method to estimate the amount of living microbial mass?
- (A) By estimating total protein levels
 - (B) By estimating total DNA levels
 - (C) By estimating total ATP levels
 - (D) By estimating total carbon levels
- 79 Which of the following amino acid was not found to be synthesized in Miller's experiment?
- (A) Glycine
 - (B) Aspartic acid
 - (C) Methionine
 - (D) Alanine
- 80 While using any pair of carbon compounds as long as other nutrients are not limiting, the bacteria shows _____ growth.
- (A) Diauxic
 - (B) Continuous
 - (C) Batch
 - (D) Synchronous
- 81 While separation of a protein mixture, a protein (Mw 65kDa, pI 6.7) is contaminated with two other proteins, one with a similar molecular mass and pI of 7.0 whereas the other has a molecular mass of 120 kDa and pI of 6.5. Suggest a procedure to purify the protein
- (A) By size exclusion chromatography only
 - (B) By size exclusion chromatography followed by ion exchange chromatography
 - (C) By ion exchange chromatography only
 - (D) By hydrophobic interaction chromatography
- 82 Which method was used to sequence the human genome?
- (A) Cytogenetic mapping
 - (B) Shotgun sequencing
 - (C) Chromosome walking
 - (D) Radiation hybrid mapping
- 83 On the basis of the given cladogram which species are most closely related?
- (A) E-F
 - (B) A-C
 - (C) B-F
 - (D) D-E

- 84 Which one of the following is the correct sequence of chemical substances produced during the origin of life on the earth?
- (A) Water, amino acid, nucleic acid, enzyme
 - (B) Water, amino acid, enzyme, nucleic acid
 - (C) Water, nucleic acid, enzyme, amino acids
 - (D) Water, nucleic acid, amino acid, enzyme
- 85 Which of the following is often used to establish family trees for organisms because it is present in all organisms and does not accumulate mutations quickly?
- (A) rRNA
 - (B) Fibrino peptides
 - (C) Chloroplasts
 - (D) Mitochondrial DNA
- 86 Which of the following prokaryotic organism has the largest genome known till date?
- (A) *Bradyrhizobium japonicum*
 - (B) *Myxococcus xanthus*
 - (C) *Saccharomyces cerevisiae*
 - (D) *Sorangium cellulosum*
- 87 If the pathogens have spread on the large area then which principle you need to apply to stop them from entering the newer area?
- (A) Exclusion
 - (B) Eradication
 - (C) Avoidance
 - (D) Protection
- 88 Which of the following quantitative proteomics method utilizes light and heavy versions of biotinylated iodoacetamide reagent to label the proteome sample?
- (A) Protein microarrays
 - (B) Isotope coded affinity tag
 - (C) Metabolic stable isotope coding
 - (D) Enzymatic stable isotope coding
- 89 In phylogenetic analysis the _____ evolutionary model computes distances based on the assumption of equal probability for all substitutions (transitions and transversions).
- (A) Bootstraping
 - (B) Jukes-Cantor
 - (C) UPGMA
 - (D) Kimura
- 90 _____ is the physical manifestation of the sum of genetic and environmental effects.
- (A) Genotype
 - (B) Phenotype
 - (C) Morphotype
 - (D) Phyllotype

- 91 A transcription unit is 8000 nucleotides long. If only 15% of this unit is exon, calculate the appropriate molecular weight of the protein encoded.
- (A) 40 kDa
 - (B) 1200 kDa
 - (C) 44 kDa
 - (D) 100 kDa
- 92 A linear DNA is 100% labelled at one end and has 3 restriction sites for EcoRI. If it is partially digested by EcoRI so that all possible fragments are produced, how many of these fragments will be labelled and how many non-labelled?
- (A) 4 labelled; 6 unlabelled
 - (B) 4 labelled; 4 unlabelled
 - (C) 3 labelled; 5 unlabelled
 - (D) 3 labelled; 3 unlabelled
- 93 Which of the following next-generation sequencing method does not utilize optical detection, instead it utilizes semiconductors to measure the release of protons (H⁺) when new dNTP is added to a growing strand of DNA?
- (A) Oxford nanopore
 - (B) Illumina/Solera methos
 - (C) Ion torrent
 - (D) 454 Pyrosequencing
- 94 Which of the following transcriptomics technique can accurately detect the beginning and end of mRNA transcripts to reveal post-transcriptional modifications such as intron splice-varants?
- (A) SAGE
 - (B) DNA microarrays
 - (C) RNASeq
 - (D) MudPIT
- 95 Which of the following classification has a good indicator to study evolutionary history of microbes?
- (A) Phenetic
 - (B) Phylogenetic
 - (C) Genotypic
 - (D) Proteomic
- 96 Chloroplast and mitochondria contain DNA. This support the concept of
- (A) Chromosomal mutation
 - (B) Cytoplasmic inheritance
 - (C) Transformation
 - (D) Multiple alleles
- 97 A purified dimeric protein of 70 kDa, when run by SDS PAGE, it gave a single band. What would be the size of the band?
- (A) 70 kDa
 - (B) Depends upon acrylamide % in the gel
 - (C) 35 kDa
 - (D) 45 kDa

- 98 Which of the following gas is the important cause of ozone depletion produced during denitrification process?
(A) NH_3
(B) N_2O
(C) Dinitrogen
(D) NO
- 99 Which of the following method cannot be used to measure carbon removal during waste water treatment?
(A) Total organic carbon (TOC) test
(B) Chemical Oxygen Demand (COD) test
(C) Biochemical Oxygen Demands (BOD) test
(D) pH
- 100 Which of the following is a cultivation-independent fingerprinting technique that is used for sequence-specific separation of PCR-amplified 16S rRNA genes in polyacrylamide gels containing a linear gradient of DNA denaturants.
(A) T-RFLP
(B) ARISA
(C) DGGE
(D) Phylochip
- 101 The following method utilizes an inverted light microscope and a micromanipulation device to optically trap and physically isolate single microbial cells from a mixed population for subsequent growth in pure cultures.
(A) CARD-FISH
(B) FISH-MAR
(C) Laser tweezers
(D) ARISA
- 102 Organomercurials formed by methylation of mercury in environment results into the following.
(A) Bioaccumulation
(B) Demethylation
(C) Volatilization
(D) Reduction
- 103 A microorganism producing the following compound is more suitable for biodegradation of hydrocarbon, as it helps to emulsify hydrocarbons.
(A) Siderophore
(B) Biostimulant
(C) Biosurfactant
(D) Biopesticide
- 104 The following is a heme containing, H_2O_2 dependent oxidase, involved in lignin modification.
(A) MnP
(B) LiP
(C) Laccase
(D) Azo reductase

- 105 A lichen is formed by mutualism between an algae and _____.
- (A) Diatom
 - (B) Fungus
 - (C) Phytoplankton
 - (D) Cyanobacteria
- 106 The following method of microbial diversity analysis employs a gradient of a DNA denaturant to separate rRNA genes of the same size that differ in their melting profile.
- (A) DGGE
 - (B) ARISA
 - (C) FAME
 - (D) Phylochip
- 107 The following is a measure of species diversity in a sample unit and is often determined using species richness or a diversity index.
- (A) Beta (β) diversity
 - (B) Alpha (α) diversity
 - (C) Gamma (γ) diversity
 - (D) All of above
- 108 Phylogenetic FISH stains used to observe prokaryotic microorganisms are fluorescent tagged oligonucleotides probes complementary to _____.
- (A) 18S rRNA
 - (B) 28S rRNA
 - (C) 16S rRNA
 - (D) 23S rRNA
- 109 Which of the following pathway degrades aliphatic hydrocarbons?
- (A) Glycolysis
 - (B) TCA
 - (C) β - oxidation
 - (D) Catechol
- 110 If the composition of a microbial community remains unaltered under the influence of an environmental disturbance, such type of community response is known as:
- (A) Resistance
 - (B) Functional redundancy
 - (C) Resilience
 - (D) Neutral
- 111 The following group of eukaryotic phytoplanktons is the most common source of the planktonic bioluminescence in the oceans.
- (A) Pelagibacter
 - (B) Coccolithophores
 - (C) Dinoflagellates
 - (D) Prochlorococcus

- 112 The following term is defined as transformation of organic compound by a microorganism to its elemental form.
- (A) Bioaccumulation
 - (B) Mineralization
 - (C) Biodegradation
 - (D) Cometabolism
- 113 The following is a group of marine planktonic chemoorganotrophic bacteria, which is abundant in pelagic waters and was identified using environmental 16S rRNA gene clones.
- (A) Prochlorococcus
 - (B) Dinoflagellates
 - (C) Synechococcus
 - (D) SAR11
- 114 The following automated molecular method specifically utilizes amplification of the internal transcribed spacer (ITS) region between 16S rRNA and 23S rRNA genes, which differs in length among various bacterial species.
- (A) DGGE
 - (B) ARISA
 - (C) T-RFLP
 - (D) ARDRA
- 115 The following protein binds to oxygen and helps in protection of oxygen-sensitive nitrogenase enzyme in the mature root nodules.
- (A) Nod factor
 - (B) Leghemoglobin
 - (C) VirG
 - (D) VirA
- 116 Low molecular weight antimicrobial proteins similar to antibiotics produced by certain bacteria to kill or inhibit the growth of other closely related strains are known as
- (A) Bacteriocins
 - (B) AHLs
 - (C) Penicillin
 - (D) Streptomycin
- 117 FISH stands for
- (A) Fluorescent in situ hybridization
 - (B) F1 induced strand hybrid
 - (C) Flanking insertion sequence hybrid
 - (D) Fluorescent insertion segment hybrid
- 118 Binomial Nomenclature system was given by
- (A) Watson and Crick
 - (B) Har Govind Khorana
 - (C) Carolus Linneaus
 - (D) Charles Darwin

- 119 Who rejected the concept of abiogenesis very first time?
(A) Louis Pasteur
(B) Francesco Redi
(C) John Needham
(D) John Tyndall
- 120 Lichens are the best indicator of
(A) Noise pollution
(B) Soil pollution
(C) Water pollution
(D) Air pollution
- 121 The process of successful establishment of the species in a new area is called
(A) sere
(B) climax
(C) invasion
(D) ecesis
- 122 The order of basic processes involved in succession is
(A) Nudation->invasion-> competition and co action->reaction->stabilization
(B) Nudation->stabilization-> competition and co action->invasion->reaction
(C) Invasion-> Nudation->competition and co action->Reaction->stabilization
(D) invasion->stabilization-> competition and co action->Reaction->nudation
- 123 The formation of a climax community from an abandoned farm land is an example of
(A) Autogenic succession
(B) Allogenic succession
(C) Primary succession
(D) Secondary succession
- 124 The development of a bare area without any life form is called
(A) nudation
(B) ecesis
(C) sere
(D) reaction
- 125 All the statements are correct regarding ecological succession except
(A) It is a random process
(B) Species diversity increases as succession proceeds
(C) The food chain relationships become more complex
(D) The role of decomposers becomes more and more important
- 126 The moisture contained in clouds and precipitated as snow, hail, rain etc constitutes _____
(A) Atmospheric water
(B) Surface water
(C) Groundwater
(D) Subterranean water

- 127 The surface waters are susceptible to contamination with microorganisms from _____
- (A) the air
 - (B) the surface runoff
 - (C) precipitation
 - (D) atmospheric water and the surface runoff
- 128 The Chesapeake Bay, one of the world's major estuarine system serves as the receiving basin for how many rivers?
- (A) 4
 - (B) 6
 - (C) 3
 - (D) 9
- 129 Which of the following genus of bacteria is not found in fresh waters?
- (A) Pseudomonas
 - (B) Flavobacterium
 - (C) Aeromonas
 - (D) Vibrio
- 130 Large spiralling surface currents in the ocean that tend to aggregate and retain nutrients are known as _____
- (A) benthic region
 - (B) upwelling
 - (C) geothermal vents
 - (D) gyres
- 131 Which of the following techniques is used for identification and enumeration of algae, bacteria, protozoa?
- (A) Microscopic examination
 - (B) Submerged-slide technique
 - (C) Membrane-filter technique
 - (D) Enrichment-culture technique
- 132 The biological activity of an aquatic ecosystem is dependent upon which of the following factors?
- (A) number of primary producers
 - (B) amount of chemical energy produced
 - (C) rate of primary production
 - (D) number of deaths of organisms
- 133 Which of the following aquatic organisms contribute in a small amount to the shallow estuary food web?
- (A) benthic algae
 - (B) bacteria
 - (C) protozoa
 - (D) nematodes
- 134 Which among the following are referred to as the "pasture of the sea"?
- (A) fishes
 - (B) algae
 - (C) nematodes
 - (D) phytoplankton

- 135 Which among the following factors are limiting the growth of phytoplankton organisms?
(A) carbon dioxide
(B) radiant energy
(C) water
(D) radiant energy, nitrogen
- 136 The association which involves the exchange of nutrients between two species is referred to as _____
(A) mutualism
(B) syntrophism
(C) commensalism
(D) antagonism
- 137 The degradation of complex molecules in soil by fungi for utilization by bacteria is an example of which type of association?
(A) Neutralism
(B) Mutualism
(C) Commensalism
(D) Antagonism
- 138 Which of the following inhibitory toxic product is produced by Fungi?
(A) cyanide
(B) fatty acids
(C) methane
(D) sulphides
- 139 Which of the following organisms are known to grow on the surfaces of freshly exposed rocks?
(A) green algae
(B) diatoms
(C) cyanobacteria
(D) yeast
- 140 Ammonia oxidizers and nitrite oxidizers are _____
(A) Gram-negative chemolithotrophs
(B) Gram-positive chemolithotrophs
(C) Gram-negative photolithotrophs
(D) Gram-positive photolithotrophs
- 141 Agrobacterium is involved in which of the following processes?
(A) Ammonification
(B) Nitrification
(C) Reduction of nitrate to ammonia
(D) Denitrification
- 142 Which of the following conditions decreases the level of denitrification?
(A) Abundance of organic matter
(B) Acidic pH
(C) Elevated temperatures
(D) Availability of oxygen

- 143 Which of the following are not the features of component II of nitrogenase enzyme complex?
(A) component II is nitrogenase reductase
(B) component II is known as the MoFe protein
(C) contains sulfur
(D) not active without component I
- 144 Which of the following is symbiotic nitrogen fixing bacteria?
(A) *Rhizobium trifolii*
(B) *Clostridium pasteurianum*
(C) *Azotobacter* spp.
(D) *Escherichia coli*
- 145 Which among the following are the most important agents for carbon dioxide fixation?
(A) bacteria
(B) fungi
(C) algae
(D) protozoa
- 146 In carbon cycle flow of energy is _____
(A) bidirectional
(B) linear
(C) cyclic
(D) irreversible
- 147 Cysteine breaks down in presence of cysteine desulfurase to give _____
(A) oxaloacetic acid
(B) sulphuric acid
(C) pyruvic acid
(D) glyoxylate
- 148 The reduction of sulphates and sulphites to hydrogen sulphide is done by which group of bacteria?
(A) aerobic sulfate-reducing bacteria
(B) photosynthetic sulphur bacteria
(C) anaerobic sulphate-reducing bacteria
(D) heterotrophic bacteria
- 149 Which among the following develop in the upper portion of the Winogradsky column?
(A) Sulfate-reducing bacteria
(B) Green-sulfur bacteria
(C) Purple-sulfur bacteria
(D) Thiobacilli
- 150 Which of the following sewerage systems carry domestic and industrial wastewater?
(A) sanitary sewers
(B) storm sewers
(C) combined sewers
(D) storm and combined sewers

- 151 Which of the following is a strict anaerobe?
(A) Enterobacter
(B) Alcaligenes
(C) Pseudomonas
(D) Methanosarcina
- 152 Which of the following treatment involve oxidation of organic constituents of the wastewater?
(A) Primary treatment
(B) Secondary treatment
(C) Advanced treatment
(D) Final treatment
- 153 The release of untreated water into the surface water causes deterioration of water quality and it's _____
(A) volume
(B) temperature
(C) lipophilicity
(D) biological characteristics
- 154 Which of the following is not caused as a result of the altered primary productivity of water bodies?
(A) Algal blooms
(B) Adverse health effects
(C) Reduction in water quality
(D) Increase in water quality
- 155 Which of the following process is not involved in the removal of nitrogen?
(A) Nitrification
(B) Ammonification
(C) Denitrification
(D) Desalination
- 156 Expand OLNAD.
(A) Oxygen limited nitrification and denitrification
(B) Oxygen reduced nitrification and denitrification
(C) Oxygen limited ammonification and denitrification
(D) Oxygen reduced nitrification and ammonification
- 157 Which of the following method can be used to treat crude sewage and nitrify secondary effluent?
(A) Duck weed ponds
(B) Reed beds
(C) Algal fish ponds
(D) Water hyacinth pond
- 158 High energy intervention is referred as _____
(A) HPLC
(B) Intensive technologies
(C) PAM
(D) Optical Microscopy

- 159 Which of the following is an intensive method of land treatment?
(A) Rapid infiltration
(B) Infiltration
(C) Slow rate
(D) Over flow
- 160 What is the percentage of aerobically digested sludge?
(A) 0.2-0.5
(B) 0.3-0.6
(C) 1.0-2.0
(D) 1.5-3.0
- 161 $W_s = W_{sp} + W_{ss}$ What does W_{sp} stand for in the above equation?
(A) Total dry solids
(B) Raw primary solids
(C) Suspended solids
(D) Polluted solids
- 162 Which are the three ingredients in activated sludge systems?
(A) Cells, sewage and oxygen
(B) Cells, sewage and nitrogen
(C) Solids, sewage and oxygen
(D) Solids, water and oxygen
- 163 For the conversion of particulate organics through Activated Sludge Process (ASP) what would be the Solid retention time considered?
(A) 18 hours
(B) 1-2 days
(C) 2-4 days
(D) 5 days
- 164 What is the typical value of the F/M ratio considered for an extended ASP process?
(A) 0.04 g/g.d
(B) 0.1 g/g.d
(C) 0.4 g/g.d
(D) 0.01 g/g.d
- 165 What is the COD loading rate assumed for an up flow anaerobic sludge blanket (UASB)?
(A) 4-12 Kg COD/m³
(B) 12-20 Kg COD/m³
(C) 2-4 Kg COD/m³
(D) 20-25 Kg COD/m³
- 166 Which type of reactor is not used for oxidation?
(A) Packed bed reactor
(B) Stirred tanks
(C) Tank in series
(D) Venturi reactor

- 167 What is the mathematical representation of a completely stirred reactor after a tracer is added?
(A) $\tau=V/Q$
(B) $C=C_0e^{-1/\tau}$
(C) $\tau=Q/V$
(D) $C_0=Ce^{-1/\tau}$
- 168 Skimmed milk can be processed into drinking milk by addition of cream and _____
(A) Algal cultures
(B) Pathogens
(C) Bacterial cultures
(D) Fungi
- 169 Which among the following is a competitive and sustainable alternative for environment?
(A) Bio-leaching
(B) Bio-remediation
(C) Bio-fortification
(D) Immobilization
- 170 Solidification is based on _____
(A) CO₂ release
(B) Time consumption
(C) Consume lots of energy
(D) Encapsulation
- 171 Which of the following is a drawback of biological method of soil remediation?
(A) Contaminants may not be conducive
(B) Residual effects of human activities
(C) Biological contaminants
(D) Non-Biological contaminants
- 172 Which of the following methods can be used to convert organic pollutants into fish biomass?
(A) Duck weed ponds
(B) Reed beds
(C) Algal fish ponds
(D) Water hyacinth pond
- 173 Which of the following is an example of extensive method?
(A) Soil washing
(B) Cropping of plants that accumulate heavy metals
(C) Global warming
(D) Carbonate equilibrium
- 174 Which among the following doesn't have higher potential to soil remediation?
(A) Bacteria
(B) Plants
(C) Fungi
(D) Pathogens

- 175 Bio-remediation is most suitable for the degradation of _____
- (A) Methane
 - (B) Nitrogen
 - (C) Organic chemicals
 - (D) Carbon dioxide
- 176 Which among the following is not considered as the principal environmental factor?
- (A) pH
 - (B) Temperature
 - (C) Soil type
 - (D) Pressure
- 177 What is the preferable range of temperature for bioremediation by soil microorganisms?
- (A) 0-50°C
 - (B) 50-60°C
 - (C) 80-100°C
 - (D) 120-150°C
- 178 Which among the following does not determine the suitability of soil remediation?
- (A) Nutrient availability
 - (B) Presence of other inhibitory contaminants
 - (C) Oxygenation
 - (D) Pathogens
- 179 Functional biology is usually described as a process of bio enhancement (and/or) _____
- (A) Bio-augmentation
 - (B) Bio-accumulation
 - (C) Bio-degradation
 - (D) Bio-magnification
- 180 Aerobic bio degradation has a minimum oxygen requirement of _____
- (A) 0.5 mg/litre
 - (B) 2 mg/litre
 - (C) 1 mg/litre
 - (D) 1.5 mg/litre
- 181 In-situ based bio remediation involves introducing _____ to contaminated areas.
- (A) Oxygen and nutrients
 - (B) Carbon dioxide and methane
 - (C) Nitrogen and CO₂
 - (D) CO and methane
- 182 Which among the following processes doesn't come under phyto-remediation?
- (A) Bio-accumulation
 - (B) Concentration and excavation
 - (C) Phytoextraction
 - (D) Phytostabilisation

- 183 _____ can be used to degrade typical contaminants using carbon source for their growth.
- (A) Microbes
 - (B) Chemicals
 - (C) Quorum quenching
 - (D) Lyophilization
- 184 The process by which microorganisms utilize contaminants as their food source thereby degrading them is called as _____
- (A) Inorganic compounds
 - (B) Isolated bio-components
 - (C) Toxic compounds
 - (D) Mineralisation
- 185 Which of the following treatment options is not suitable for areas where contaminants don't cause a potential harm to human health and the environment?
- (A) Natural attenuation
 - (B) Passive remediation
 - (C) Bio attenuation
 - (D) Live attenuated
- 186 Bio enhancement stimulates the existing micro fauna by _____
- (A) Manipulating the local environmental conditions
 - (B) Entering the food chain
 - (C) Increasing dissolved oxygen
 - (D) Producing methane gas
- 187 Which among the following is not caused due to presence of heavy metals in the soil micro-biome during a remediation process?
- (A) Increased mobilization of heavy metals
 - (B) Inhibition of biological processes
 - (C) Iron precipitation
 - (D) Increase in soil fertility
- 188 Which of the following technique is used to re-mediate contamination at the boundary level of water table?
- (A) Biosparging
 - (B) Bio-accumulation
 - (C) Bio-degradation
 - (D) Bio-magnification
- 189 Which of the following is used to isolate the processes taking place in lined earthworks?
- (A) Low density lipoprotein
 - (B) High density lipoprotein
 - (C) Low density polyethylene liner
 - (D) High density polyethylene (HDPE) liner
- 190 Land farming processes relies on indigenous microorganisms to bring about _____
- (A) Oxidation of sodium thiosulphate
 - (B) Methanogenesis
 - (C) Remediation
 - (D) Acetogenesis

- 191 To increase the speed and efficiency of Soil banking method, _____ is used.
- (A) Engineered biopiling
 - (B) Soil slurry bioreactors
 - (C) Land farming
 - (D) Bio-sparging
- 192 Which of the following is not an after effect of soil salinization?
- (A) Reduction in soil quality
 - (B) Limited growth of crops
 - (C) Constrains agricultural productivity
 - (D) Increases the soil fertility
- 193 Sea water intrusions consist of a lot of Geo-chemical process, which of the following is not included in the same?
- (A) Inter-aquifer mixing
 - (B) Anthropogenic contamination
 - (C) Increasing dissolved oxygen
 - (D) Mobilization of brines
- 194 Which of the salts are found in abundance in coastal saline soils?
- (A) Oxygen
 - (B) NaCl and Na₂SO₄
 - (C) Nitrogen
 - (D) Carbon monoxide
- 195 Arrange these soluble cations (Na, Ca, K, Mg) in ascending order of abundance of soluble cations found in saline costal soils.
- (A) Na>Mg>Ca>K
 - (B) Mg>Na>Ca>K
 - (C) K>Mg>Ca>Na
 - (D) Na>Mg>K>Ca
- 196 Which among the following is a method of managing the soil salinity?
- (A) Drainage
 - (B) Harmful algal blooms
 - (C) Bio-remediation
 - (D) Bio-degradation
- 197 What would be the effect on plants if the soil's pH increases?
- (A) Nutrient absorption is reduced
 - (B) Nutrient absorption increases
 - (C) Soil contamination
 - (D) Soil fertility increases
- 198 Which of the following plants can grow in a pH range of 5-5.5?
- (A) Rhododendrons
 - (B) Cactus
 - (C) Tagetes
 - (D) China rose

- 199 Which of the following methods does not lead to the generation of mine wastes?
- (A) Extraction of minerals
 - (B) Beneficiation of minerals
 - (C) Processing of minerals
 - (D) Remediation of mine waste
- 200 Which of the following term is not used in place of the term "Tailings"?
- (A) Mine dumps
 - (B) Culm dumps
 - (C) Terra-coned
 - (D) Mine drainage

Environmental Biotechnology

Provisional Answer Key

Q.No	Option	Q.No	Option	Q.No	Option	Q.No	Option
1	B	51	C	101	C	151	D
2	B	52	C	102	C	152	B
3	B	53	B	103	C	153	D
4	A	54	B	104	A	154	D
5	B	55	A	105	B	155	D
6	C	56	D	106	A	156	A
7	A	57	A	107	B	157	B
8	B	58	B	108	C	158	B
9	A	59	A	109	C	159	A
10	B	60	A	110	A	160	C
11	D	61	A	111	C	161	B
12	B	62	C	112	B	162	A
13	C	63	D	113	D	163	C
14	A	64	B	114	B	164	B
15	B	65	C	115	B	165	A
16	C	66	A	116	A	166	A
17	C	67	A	117	A	167	B
18	D	68	C	118	C	168	C
19	D	69	B	119	B	169	B
20	A	70	D	120	D	170	D
21	B	71	D	121	D	171	A
22	D	72	B	122	A	172	A
23	B	73	A	123	D	173	B
24	A	74	B	124	A	174	D
25	B	75	B	125	A	175	C
26	A	76	C	126	A	176	D
27	B	77	B	127	D	177	A
28	C	78	C	128	D	178	D
29	D	79	C	129	D	179	A
30	A	80	A	130	D	180	B
31	A	81	B	131	A	181	D
32	C	82	B	132	C	182	B
33	B	83	B	133	A	183	A
34	C	84	A	134	D	184	D
35	C	85	A	135	D	185	D
36	C	86	D	136	B	186	A
37	D	87	B	137	C	187	D
38	A	88	B	138	A	188	A
39	B	89	B	139	C	189	D
40	C	90	B	140	A	190	C
41	C	91	C	141	D	191	A
42	C	92	A	142	B	192	D
43	A	93	C	143	B	193	C
44	D	94	C	144	A	194	B
45	B	95	B	145	C	195	A
46	C	96	B	146	B	196	A
47	C	97	C	147	C	197	A
48	C	98	B	148	C	198	A
49	A	99	D	149	D	199	D
50	B	100	C	150	A	200	D