



## Gujarat Biotechnology Research Centre

### Scientist - B (Group-1) Industrial/Environmental Biotechnology Mains

#### Question Paper

**Exam Date: 30 April 2023**

**Time: 01:30 pm to 03:30 pm**

1	Natural wetlands contribute to global warming by emission of which of the following greenhouse gas?		D
	A   Ammonia	B   Methane	
	C   Nitrous oxide	D   N <sub>2</sub> O and CH <sub>4</sub>	
2	Which of the following is an <i>In situ</i> bioremediation method that introduces air in the unsaturated vadose zone to induce microbial activity for biodegradation of soil contaminants?		A
	A   Bioventing	B   Biopharming	
	C   Bioaugmentation	D   Biosparging	
3	In which of the following waste remediation process, the organic solid wastes are decomposed and transformed into humus like substances under controlled aerobic conditions?		C
	A   Biomethanation	B   Activated Sludge	
	C   Composting	D   All of them	
4	Which of the following methods, measures the amount oxygen consumed for oxidation of organic matter by potassium dichromate under acidic conditions?		D
	A   Total Kjeldahl Nitrogen (TKN)	B   Total Organic Carbon (TOC)	
	C   Biochemical Oxygen Demand (BOD)	D   Chemical Oxygen Demand (COD)	
5	The thermal decomposition of organic biomass at elevated temperatures, in the absence of oxygen is known as _____.		B
	A   Incineration	B   Pyrolysis	
	C   Photochemical oxidation	D   Electrolysis	
6	Which of the following is a correct sequence of biological processes in anaerobic digestion?		C
	A   Methanogenesis → Hydrolysis → Acetogenesis → Acidogenesis	B   Hydrolysis → Acetogenesis → Acidogenesis → Methanogenesis	
	C   Hydrolysis → Acidogenesis → Acetogenesis → Methanogenesis	D   Acidogenesis → Hydrolysis → Acetogenesis → Methanogenesis	
7	The process of extraction of valuable metals from low-grade ores using microorganisms is known as _____.		D
	A   Biomagnification	B   Biostimulation	
	C   Biodegradation	D   Bioleaching	
8	Eutrophication of water bodies is mainly caused by excess inputs of _____ containing wastewater.		B
	A   Nitrogen and Potassium	B   Nitrogen and Phosphate	
	C   Calcium and Magnesium	D   Hydrogen sulfide and NH <sub>3</sub>	
9	The process in which ammonium is oxidized by microorganisms using nitrite as an electron acceptor along with generation of dinitrogen gas under anaerobic conditions is known as _____.		B
	A   Nitrification	B   Annamox	



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	C   Denitrification	D   Nitrogen fixation	
10	The transformation of a non-growth substrate by microorganisms in the obligate presence of a growth substrate is termed as _____.		
	A   Mineralization	B   Co-metabolism	B
	C   Oligotrophy	D   Copiotrophy	
11	In which of the following phytoremediation processes, the heavy metal pollutants are accumulated into aboveground plant tissues after uptake from roots?		
	A   Phytoextraction	B   Phytovolatilization	A
	C   Rhizodegradation	D   All of the above	
12	Which of the following device is used to collect water samples at desired depths from the water bodies?		
	A   AGI-30 sampler	B   Van Veen grab sampler	D
	C   Andersen 6-STG sampler	D   Niskin sampler	
13	Which of the following next-generation sequencing method detects epigenetic modifications in the genome sequence by measuring the interpulse duration (IPD) between fluorescently labelled nucleotide incorporations?		
	A   Ion Torrent	B   Illumina MiSeq	C
	C   PacBio SMRT	D   SOLiD	
14	The entire set of genes present in all individuals of a particular species, which can be subdivided into the core and accessory genomes is known as _____.		
	A   Metagenome	B   Epigenome	D
	C   Microbiome	D   Pangenome	
15	If you are sequencing a bacterial genome of $2 \times 10^6$ bp length and you obtain 4500 reads with average lengths of 2000 bp, what will be the estimated coverage of the genome sequence in this experiment?		
	A   3.5x	B   0.22x	C
	C   4.5x	D   1.5x	
16	Homologous genes arising by gene duplication events within a single organism and encoding proteins with related but non-identical functions are known as _____.		
	A   Orthologs	B   Paralogs	B
	C   COGs	D   Pseudogenes	
17	In which of the following proteomics method, the Acid-CNBr/Trypsin digests of proteome samples are separated and identified using biphasic SCX-RP microcapillary chromatography coupled with MS/MS analysis?		
	A   2D-DIGE	B   Stable-isotope probing	C
	C   MudPIT	D   Y2H	
18	If you are constructing a genomic library of the human genome ( $3.3 \times 10^9$ bp) and you desire to obtain an average insert size of 200 Kb. What will be the number of clones that you will require for a four-fold coverage of the entire genome		



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	sequence?				
	A	44000 clones	B	66000 clones	B
	C	16500 clones	D	88000 clones	
19	The immobilized pH gradient (IPG) strips are used in 2D-PAGE for _____.				
	A	Mass fingerprinting	B	Isoelectric focusing	B
	C	Size fractionation	D	All of them	
20	Light and heavy versions of biotinylated-iodoacetamide reagent are used for differential labelling of proteins in _____ proteomics method.				
	A	Protein microarrays	B	Isotope-coded affinity tag	B
	C	Enzymatic stable-isotope coding	D	Metabolic stable-isotope coding	
21	What is CRISPR?				
	A	Sequences derived from viral DNA fragments by the bacterial genome	B	A gene-editing tool used to modify DNA/RNA sequence	D
	C	A bacterial defense mechanism against viruses	D	All of the above	
22	The enzymatic activity of the Cas9 protein can be compared to which of the following?				
	A	RNA-dependent DNA endonuclease	B	RNA dependent RNA polymerase of gRNA	A
	C	DNA dependent Kinase	D	Reverse Transcriptase M-MuLV	
23	What does sgRNA stand for and why?				
	A	Shorter guide RNA, because it is only 100 bp	B	Simple guide RNA, because it makes gene editing simple	D
	C	Short genomic RNA, since it binds genomic DNA	D	Single guide RNA, because it is a fusion of crRNA and tracrRNA	
24	Which of the following method involves preparation of cDNA libraries for an in vitro screening of binary protein-protein interactions?				
	A	Protein microarrays	B	Phage Display	B
	C	Yeast-two hybrid system	D	Tandem-affinity purification	
25	Identify the most appropriate flow of steps from the given options, in order to perform a liquid chromatography experiment for separation of biomolecules in a given biological sample?				
	A	Elution → Column equilibration → Sample loading → Column Regeneration	B	Column equilibration → Elution → Sample loading → Column Regeneration	D
	C	Sample loading → Column equilibration → Elution → Column Regeneration	D	Column equilibration → Sample loading → Elution → Column Regeneration	
26	The _____ chromatography method separates biomolecules based on their net surface charge.				



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	A	Gel-filtration	B	Affinity	D
	C	Hydrophobic-interaction	D	Ion-exchange	
27	In cation-exchange chromatography the stationary phase matrix contains _____ functional groups.				
	A	Positively-charged	B	Negatively-charged	B
	C	Uncharged	D	Basic	
28	Greenhouse effect is caused by absorption and re-emission of _____ radiations emitted by the sun.				
	A	UV-C	B	UV-B	C
	C	Infrared	D	X-rays	
29	The resolving power of an optical microscope depends on _____.				
	A	Numerical aperture of the lens systems	B	Wavelength of light emitted from the light source	D
	C	Refractive index	D	Wavelength of light used and numerical aperture of the lens system	
30	Absorbance of a purified DNA sample was measured in a UV-Visible spectrophotometer at 260 nm wavelength. The absorbance reading of 0.4 was obtained, what will be the concentration of the double stranded DNA in this sample?				
	A	20 µg/ml	B	104 µg/ml	A
	C	40 µg/ml	D	0.4 µg/ml	
31	Identify the incorrect statement on antibiotic drugs from the options given below:				
	A	Certain Fungi such as Penicillium sp. are the source of β-lactam antibiotics.	B	Soil bacteria such as Actinomycetes can produce several different classes of antibiotics.	D
	C	Antibiotics can be chemically modified or can be produced by chemical synthesis.	D	All antibiotics are bactericidal towards their target bacterium.	
32	The conjugal transfer of a plasmid encoding a beta-lactamase gene from a non-pathogenic bacterium to a clinical pathogen, is an example of _____.				
	A	Intrinsic resistance	B	Acquired resistance	B
	C	Target modification	D	All of the above	
33	Which of the following antibiotic does not inhibit protein synthesis in its target bacteria?				
	A	Tetracycline	B	Azithromycin	C
	C	Ampicillin	D	Chloramphenicol	
34	The broth-micro dilution method is used to determine the _____ of an antimicrobial compound.				



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	A	Minimal Inhibitory Concentration (MIC)	B	Effective Concentration (EC <sub>50</sub> )	A
	C	Lethal Dose (LD <sub>50</sub> )	D	All of the above	
35	The attachment of Rhizobium to root hairs involves specific bacterial protein called _____ and host plant lectins.				
	A	Leghemoglobin	B	Muropeptide	C
	C	Rhcadhesin	D	Nod factors	
36	The microbe-microbe interaction between <i>Bdellovibrio</i> sp. and <i>Escherichia coli</i> can be classified as _____.				
	A	Commensalism	B	Syntrophism	C
	C	Predation	D	Mutualism	
37	The following is a measure of species diversity in a sample unit, which is often determined using species richness or a diversity index.				
	A	Alpha ( $\alpha$ ) diversity	B	Beta ( $\beta$ ) diversity	A
	C	Gamma ( $\gamma$ ) diversity	D	All of the above	
38	The biodegradability indices (BI i.e., ratio of BOD <sub>5</sub> to COD) of different wastewater samples is given below. Identify the BI index for the wastewater sample which is most easily biodegradable?				
	A	0.2	B	0.4	D
	C	0.6	D	0.8	
39	Which of the following fluorescence-in situ hybridization (FISH) method utilizes peroxidase enzyme-conjugated nucleic acid probe instead of a fluorescent dye labeled probe for targeting mRNA within bacterial cells.				
	A	Phylo-Chip	B	CARD-FISH	B
	C	Laser Tweezers	D	FISH-MAR	
40	Upon biomagnification of an environmental pollutant at different trophic levels, its concentration will be highest in _____ consumers.				
	A	Primary	B	Secondary	C
	C	Tertiary	D	All of the above	
41	Red tide, a type of toxin producing harmful algal bloom (HAB) is caused by overgrowth of <i>Alexandrium</i> spp. that belongs to _____ group of marine eukaryotic phytoplanktons.				
	A	Diatoms	B	Dinoflagellate	B
	C	Coccolithophores	D	SAR11	
42	Which of the following microarrays are used to identify microbial taxonomic diversity in a sample by hybridization with small-subunit rRNA gene pools?				
	A	GeoChip	B	PhyloChip	B
	C	Chip-on-Chip	D	All of the above	
43	Which of the following device is used to optically trap and physically isolate single microbial cells from a mixed population for subsequent growth in pure				



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	cultures?				
	A	Fluorescence microscope	B	Diffusion chamber	D
	C	iChip	D	Laser tweezers	
44	In the activated sludge process, the sludge bulking caused by the overgrowth of filamentous microorganisms is influenced by which of the following conditions in the aeration basin?				
	A	lower dissolved oxygen concentrations	B	Lower F/M ratio	D
	C	Lower pH	D	All of the above	
45	Which of the following devices, can be used for cultivation of previously uncultivable microorganisms?				
	A	iChip	B	Diffusion chamber	D
	C	Microfluidic system	D	All of the above	
46	Which of the following is not a method for antimicrobial susceptibility testing?				
	A	Broth Dilution	B	Agar Dilution	D
	C	Kirby-Bauer Disc Diffusion	D	MTT assay	
47	Which of the following techniques, is used to detect specific proteins in biological samples?				
	A	Southern Blotting	B	Northern Blotting	D
	C	North-South Blotting	D	Western Blotting	
48	In response to an environmental disturbance, if the composition of a microbial community remains unaltered, this phenomenon is known as _____ of the microbial community.				
	A	Functional redundancy	B	Resilience	C
	C	Resistance	D	All of the above	
49	Which of the following bacteria will form colonies with greenish-metallic sheen after incubation at 37°C for 24 h on the Eosin methylene blue (EMB) agar?				
	A	<i>Escherichia coli</i>	B	<i>Salmonella typhi</i>	A
	C	<i>Enterobacter aerogenes</i>	D	<i>Candida albicans</i>	
50	The microbe-microbe interaction in which one of the microbial populations is benefited, while the other microbial population is neither benefited nor harmed is known as _____.				
	A	Amensalism	B	Mutualism	C
	C	Commensalism	D	Neutralism	
51	Which of the following is not the criteria of an ideal indicator organism for monitoring of fecal contamination in water samples?				
	A	It should not reproduce in the contaminated water	B	It should be easily and rapidly detected in a water sample	C
	C	It should be an intestinal pathogen of warm-blooded animals	D	It should survive longer than enteric pathogens	



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52	Air sampling devices which trap the bioaerosols in an agricultural field into a liquid matrix are based on _____ method.			B	
	A	Centrifugation	B		Impingement
	C	Impaction	D		Filtration
53	Andersen 6-STG air sampling device for bioaerosol and microbial particle sizing is based on _____ method.			D	
	A	Impingement	B		Centrifugation
	C	Filtration	D		Impaction
54	Which of the following size category of bioaerosols would travel the furthest into the respiratory system and pose a greater risk to human health?			B	
	A	Accumulation mode	B		Nuclei mode
	C	Coarse mode	D		All of the above
55	A microbial community with less species diversity and evenness, along with higher dominance of certain species, would have higher values for which of the following microbial diversity index?			D	
	A	Alpha Index	B		Shannon Index
	C	Delta Index	D		Simpson's Index
56	A bacterial isolate resistant to ampicillin will produce which of the following enzymes?			A	
	A	$\beta$ -lactamase	B		$\beta$ -galactosidase
	C	Glucuronidase	D		Urease
57	The coliform group of bacteria are differentiated in the laboratory by their ability to ferment _____ with the production of acid and gas at 35°C within 24 hours.			D	
	A	Glucose	B		Fructose
	C	Maltose	D		Lactose
58	Which of the following enzyme is used to digest the peptidoglycan layer in the bacterial cell walls, in order to break the bacterial cells for genomic DNA isolation.			D	
	A	Proteinase K	B		Chitinase
	C	Cellulase	D		Lysozyme
59	Which of the following reagents, is used in RNA isolation to inhibit the activity of RNAses?			B	
	A	Ethanol	B		DEPC
	C	DTT	D		EDTA
60	In gel filtration chromatography, _____ analytes will not penetrate inside the pores of the gel beads and will therefore elute out first.			A	
	A	Large	B		Small
	C	Charged	D		All of the above
61	In yeast-two hybrid system, a prey library is constructed by cloning the cDNA sequences in frame with the coding sequence of _____ domain of the GAL4 transcription factor.				



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	A   Ribosome-binding	B   Histone-binding	C
	C   Transcription activation	D   DNA-binding	
62	A dichromatic mirror is used to selectively reflect shorter wavelength of light on the specimen and transmit only longer wavelength of light emitted by the specimen in which of the following microscopy techniques?		
	A   Electron microscopy	B   Phase contrast microscopy	C
	C   Fluorescence microscopy	D   All of the above	
63	Which among the following is used to obtain a three-dimensional image of the virus particles?		
	A   Compound Microscope	B   Dark-field Microscope	D
	C   Phase Contrast Microscope	D   Scanning Electron Microscope	
64	The Ni <sup>2+</sup> -NTA resin columns are used in affinity purification of _____ recombinant proteins.		
	A   GST-tagged	B   Protein-A tagged	C
	C   His-tagged	D   All of the above	
65	Which of the following next-generation DNA sequencing methods does not rely on detection of fluorescence in order to determine the nucleotide sequence?		
	A   Ion Torrent sequencing	B   Sanger sequencing	A
	C   Reversible-terminator sequencing	D   Sequencing by ligation	
66	An alkaline phosphatase enzyme is used in a blunt-ended cloning experiment to _____.		
	A   Linearize the vector	B   Prevent self-ligation of the vector	B
	C   Circularize the DNA insert	D   Phosphorylate the vector	
67	Which of the following transcriptome analysis methods, does not require prior knowledge of the genome sequence and can most accurately detect post-transcriptional modifications?		
	A   DNA Microarrays	B   RNA sequencing	B
	C   Serial analysis of gene expression	D   Rosetta stone	
68	In which of the following method, two different proteome samples are labelled on the lysine side chains with NHS-Propyl-Cy3 and NHS-Methyl-Cy5 and then separated on the same polyacrylamide gel.		
	A   2D-PAGE	B   2D-DIGE	B
	C   ICAT	D   Protein microarrays	
69	A pair of restriction enzymes that recognize different restriction sites, but upon cleavage of the DNA produce identical overhangs are known as _____.		
	A   Neoschizomers	B   Enantiomers	D
	C   Isoschizomers	D   Isocaudomers	
70	Photolithography method utilizes optical systems and _____ chemistry for selective extension of nucleotide polymers to manufacture DNA microarrays on glass chips.		



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	A	2', 3'-dideoxynucleotide	B	Phosphoramidite	B
	C	Cy3-labelled nucleotides	D	Reversible terminators	
71	The delta-delta Ct method is used in real-time PCR for _____.				
	A	Absolute quantification of gene expression	B	Determining mRNA transcription sites	C
	C	Relative quantification of gene expression	D	All of the above	
72	In the RNA-seq experiment, the raw sequence data are obtained in which of the following file format?				
	A	FASTQ	B	BAM	A
	C	CRAM	D	SAM	
73	Which of the following reagent is used in SDS-PAGE to denature and confer a net negative charge on proteins?				
	A	$\beta$ -mercaptoethanol	B	Sodium dodecyl sulfate	B
	C	Ammonium per sulfate	D	TRIzol	
74	Which of the following marine phytoplanktonic Cyanobacteria are the numerically dominant photosynthetic cells in the marine ecosystems?				
	A	<i>Pelagibacter</i>	B	<i>Oscillatoria</i>	D
	C	<i>Dinoflagellates</i>	D	<i>Prochlorococcus</i>	
75	Which of the following environmental sampling device is used to obtain sediment samples from the bottom of water bodies such as lakes, rivers or sea floors?				
	A	Hollow tube augur	B	Van Veen grab sampler	B
	C	Van Dorn bottle	D	All of the above	
76	A short region of DNA sequence, about 200 -300 bases long that occurs at just one position in the genome is called _____.				
	A	Long Interspersed Nuclear Elements (LINEs)	B	Single nucleotide polymorphism (SNP)	D
	C	Short tandem repeat (STR)	D	Sequence tagged site (STS)	
77	The presence of _____ sequences in a genome can result in erroneous matching of overlapping sequences in the shotgun sequencing approach.				
	A	Paired-end read	B	Exons	C
	C	Repetitive	D	Contiguous	
78	Which of the following method is used for the biochemical characterization of candidate protein-protein interactions.				
	A	FRET	B	Rosetta stone	A
	C	Domain-fusion	D	All of the above	
79	A microbial biogeochemical process of reducing nitrate and nitrite to gaseous forms of nitrogen is known as _____.				
	A	Anammox	B	Denitrification	B
	C	Re-nitrification	D	Nitrogen fixation	



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80	A subviral entity that contains neither DNA nor RNA and is a causative agent of bovine spongiform encephalopathy (mad cow disease) is known as _____.			D	
	A	Viroids	B		Retrovirus
	C	Adenovirus	D		Prions
81	Hormogonia are the motile filaments which are usually produced during vegetative reproduction in _____.			B	
	A	Proteobacteria	B		Cyanobacteria
	C	Actinomycetes	D		All of the above
82	Which of the following is a biochemical method used to differentiate between taxonomic groups of microorganisms by identifying their signature fatty acid profiles.			D	
	A	DGGE	B		BIOLOG
	C	ARISA	D		FAME
83	Low molecular weight antimicrobial proteins produced by certain bacteria to inhibit the growth of similar or closely related bacterial strains are known as _____.			B	
	A	Acyl homoserine lactones	B		Bacteriocins
	C	Autoinducers	D		Lectins
84	Which of the following is an application of gel-filtration chromatography?			D	
	A	Relative molecular mass determination	B		Protein purification
	C	Desalting	D		All of the above
85	In ion-exchange chromatography, if the pH of the mobile phase is changed by mixing two different solvents during elution, such type of elution process is known as _____.			B	
	A	Isocratic elution	B		Gradient elution
	C	Isopycnic elution	D		All of the above
86	Which of the following methods, is used for the specific purification of mRNA from a total RNA preparation?			C	
	A	TRIzol method	B		CTAB method
	C	Affinity chromatography on oligo(dT)-columns	D		Ion-exchange chromatography
87	Which of the following purity ratio (A <sub>260</sub> /A <sub>280</sub> ) indicates that an isolated DNA sample is contaminated with proteins?			D	
	A	2.2	B		1.8
	C	2.0	D		1.2
88	Precipitation of proteins can be achieved by use of which of the following reagent?			D	
	A	Acetone	B		Polyethylene glycol
	C	Ammonium sulfate	D		All of the above
89	In agarose gel electrophoresis of DNA, _____ is used as a tracking dye to				



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	monitor the progress of electrophoretic migration.				
	A	Bromophenol blue	B	Coomassie brilliant blue	A
	C	Ethidium bromide	D	Crystal violet	
90	The separation of proteins in SDS-PAGE occurs on the basis of differences in their _____.				
	A	Net surface charge	B	Molecular weight	B
	C	Charge-to-mass ratio	D	Isoelectric point (pI)	
91	Which of the following paper chromatography methods, is most suitable for achieving separation of a complex mixtures of analytes having similar partition coefficients?				
	A	Ascending	B	Descending	D
	C	Radial	D	Two-Dimensional	
92	Which of the following program is not used for validation of proteins structures?				
	A	PROCHECK	B	PHYLLIP	B
	C	VADAR	D	All of the above	
93	In phylogenetic analysis the _____ evolutionary model computes distances based on the assumption of equal probability for all substitutions (transitions and transversions).				
	A	Bootstrapping	B	Jukes-Cantor	B
	C	UPGMA	D	Kimura	
94	Starch and cellulose can be classified as which type of carbohydrates?				
	A	Heteropolysaccharides	B	Monosaccharides	C
	C	Homopolysaccharides	D	Disaccharides	
95	In the dual chamber microbial fuel cells, certain electroactive bacteria can mediate _____ by physical contact with the anode electrode via membrane-bound redox proteins (such as c-type cytochromes)				
	A	Direct electron transfer	B	Indirect electron transfer	A
	C	Proton permeation	D	All of the above	
96	A type of emerging contaminants, found in pharmaceuticals and personal care products (PPCPs), which mimic the natural hormones and interfere with their functions can be classified as _____.				
	A	Teratogens	B	Endocrine Disruptors	B
	C	Chelating agents	D	All of the above	
97	Potentially harmful compounds such as trihalomethanes (THMs) formed by interaction of chlorine with natural organic compounds in drinking water during chlorination treatment are known as _____.				
	A	Perfluoro-alkylated substances	B	Disinfection by-products	B
	C	Chlorofluorocarbons	D	All of the above	
98	Which of the following is a metalloenzyme (with non-heme iron) that mediates cleavage of polycyclic aromatic hydrocarbons (PAH) under aerobic conditions?				



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	A   Metallothionines	B   NADPH dehydrogenase	C
	C   Ring-hydroxylating dioxygenases	D   Azo reductases	
99	Which of the following parameters, is used as a measurement of the average time interval for which the wastewater is kept inside a bioreactor?		
	A   Hydraulic retention time	B   Organic loading rate	A
	C   Gas-diffusion rate	D   Mass equilibrium	
100	Which of the following assay, utilizing single-cell gel electrophoresis is used to evaluate the level of DNA damage in eukaryotic cells for genotoxicity assessment of environmental pollutants?		
	A   Ames test	B   Allium cepa assay	C
	C   Comet assay	D   Micronucleus test	
101	The following material is used as a bioplastics		C
	A   Polystyrene	B   Polypropylene	
	C   Polyhydroxybutyrate	D   asDextrandassadas asd d	
102	The protected fermentations uses:		C
	A   Sterilized media	B   Pasteurized media with low pH	
	C   Unsterilized media	D   Autoinduction media	
103	Marmite is an important commercial product used as a food of		A
	A   Byproduct of fermentation	B   Partially fermented sugar	
	C   Main product of fermentation	D   Completely feremented sugar	
104	The tryptophan is utilized by our body for synthesis of		A
	A   Serotonin & Melatonin	B   Serotonin & Vitamin A	
	C   Melatonin & Vitamin E	D   Vitamin A & E	
105	The principle of spray-dryer is		D
	A   Sublimation	B   Contact drying	
	C   Lyophilization	D   Adiabatic drying	
106	The cycle time of batch sterilziation consists of		
	A   Two phases	B   Three phases	B
	C   Four phases	D   Five phases	
107	Soy meal, peptone, and tryptone are used as the source of		
	A   Carbon source	B   Carbon & Nitrogen source	C
	C   Nitrogen source	D   Mineral source	
108	An airlift fermenter uses		
	A   An impeller for mixing	B   Airbubbles for mixing contents	C
	C   Differential density for mixing	D   A sprayer for mixing	
109	Which one of the following is commonly known as 'brewers yeast'?		
	A   <i>Saccharomyces ludwigi</i>	B   <i>Saccharomyces boulardii</i>	D
	C   <i>Saccharomyces pastorianus</i>	D   <i>Saccharomyces cerevisiae</i>	
110	The following is the source of vitamin A		
	A   <i>Streptococcus</i>	B   <i>Rhodotorula gracilis</i>	B



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	C	Yeast	D	<i>Escherichia coli</i>	
111	The yeast cells are good source of				
	A	Vitamin A & B	B	Vitamin D & B	B
	C	Vitamin A & D	D	Vitamin C & D	
112	Unicelled microbes grown as source of proteins are called as				
	A	Microbial proteins	B	Single cell proteins	B
	C	Unicelled proteins	D	Cellular proteins	
113	Which of the following are good source of proteins?				
	A	<i>Spirulina &amp; Chlorella</i>	B	<i>Chlorella &amp; Scenedesmus</i>	D
	C	<i>Scenedesmus</i>	D	All of the above	
114	<i>Bacillus thuringiensis</i> is used as				
	A	Insecticide	B	Fungicide	A
	C	Microbicidal agent	D	Rodenticide	
115	The enzymes involved in the TCA cycle are localized in				
	A	Plasma membrane	B	Golgi apparatus	C
	C	Mitochondrial matrix	D	Vacuoles	
116	Which type of fermentation was used to produce penicillin on large scale during World War 2?				
	A	Deep-Tank Fermentation	B	Biphasic Fermentation	A
	C	Semi-Solid Fermentation	D	Solid-State Fermentation	
117	In which growth phase penicillin production occurs?				
	A	Lag phase	B	Log phase	C
	C	Stationary phase	D	Death phase	
118	Which of the following comes under the Downstream Process?				
	A	Inoculum preparation	B	Equipment sterilization	D
	C	Media Formulation	D	Separation	
119	RNA is constituted of the following				
	A	Adenine, Cytosine, Guanine, and Uracil	B	Adenine, Guanine, Cytosine, and Thymine	A
	C	Adenine, Guanine, Uracil, and Thymine	D	Adenine, Uracil, Cytosine, and Thymine	
120	Out of the following which is an incorrect pair?				
	A	Polysaccharide - glycosidic bond	B	Nucleic acid - hydrogen bond	B
	C	Phospholipids - phosphate linkage	D	Proteins - peptide bond	
121	Which of the following will form a palindromic sequence?				
	A	AGTCCTGA	B	GTTCCAAG	C
	C	ATTGCAAT	D	GTTGGAAC	
122	Which of the following is not a crucial requirement in molecular cloning?				
	A	Protein expression	B	Vector	A
	C	Molecular cutter	D	DNA inserts	



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123	Which of the following is not produced by microorganisms?			D	
	A	Alcoholic beverages	B		Fermented dairy products
	C	Bread	D		Coffee
124	Glycolysis can occur in			D	
	A	anaerobic cells	B		aerobic cells
	C	neither aerobic and anaerobic cells	D		both aerobic and anaerobic cells
125	<i>Staphylococcus aureus</i> belongs to which type of bacteria?			A	
	A	Mesophile	B		Mesophile and psychrophile
	C	Psychrophile	D		Thermophile
126	Which of the following method can be used to determine the number of bacteria quantitatively?			B	
	A	Spread-plate	B		Pour-plate and spread plate
	C	Streak-plate	D		Pour plate
127	Vaccination was invented by			B	
	A	James Watson	B		Edward Jenner
	C	Francis Crick	D		Louis Pasteur
128	An example of a digestive hormone is			D	
	A	Lipase	B		Pepsin
	C	Amylase	D		Gastrin
129	Peptide bond is a			A	
	A	Covalent bond	B		Metallic bond
	C	Ionic bond	D		Hydrogen bond
130	Which is the first intermediate in cholesterol synthesis?			A	
	A	Mevalonate	B		Squalene
	C	Isoprene	D		Ethylene
131	Fermentation to produce alcohol by yeast <i>saccharomyces</i> is due to			A	
	A	zymase	B		trysaccharide
	C	galactose	D		saccharide
132	An amylase enzyme is produced by fungus			B	
	A	<i>Aspergillus niger</i>	B		<i>Aspergillus oryzae</i>
	C	trichodema	D		toxins
133	The bacterium which is used in preparation vitamin riboflavin is			C	
	A	<i>Leuconostoc</i>	B		<i>Lactobacillus</i>
	C	<i>Clostridium butylicum</i>	D		<i>Escherchia coli</i>
134	Anaerobic respiration of yeast produces			C	
	A	alcohol	B		carbon dioxide
	C	alcohol,carbon dioxide and other	D		ATP
135	Passage of effuents into oxidation tank is for			C	
	A	primary treatment	B		secondary treatment
	C	quaternary treatment	D		tertiary treatment



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136	An enzyme produced commercially from saccharose _____			B	
	A	lactase	B		invertase
	C	maltase	D		amylase
137	_____ in association with lipid and protein represent the main constitute of fungal cell wall.			B	
	A	methanol	B		polysaccharides
	C	rhizopus	D		biofuel
138	By _____ solar energy can be converted into biomass which in turn can be stored and used as fuel.			A	
	A	photosynthesis	B		mass
	C	hydrogen	D		gassification
139	Terpenes are derived from _____ carbon isoprene			A	
	A	Five	B		Two
	C	Three	D		Ten
140	The respiratory chain of bacteria is associated with the _____			A	
	A	cytoplasmic membrane	B		cell wall
	C	cytoplasm	D		mitochondrial membrane
141	Which is not true in case of development of commercial enzymes?			C	
	A	Screening for new and improved enzymes	B		Large scale enzyme purifications
	C	Economy, effectiveness and safety	D		Dealing with the regulatory authorities
142	Bromelain: Brewing industry:: Chymotrypsin: _____			B	
	A	Cheese making industry	B		Leather industry
	C	Pharmaceutical industry	D		Detergent industry
143	Which of the following is an intracellular enzyme?			C	
	A	Lipase	B		Papain
	C	Raffinase	D		Cellulase
144	Which of the following is obtained from Kluyveromyces species?			B	
	A	Lipase	B		Lactase
	C	Bromelain	D		Rennet
145	Which of the following doesn't cause enzyme inactivation?			B	
	A	Heat	B		Centrifugation
	C	Proteolysis	D		Sub-optimal pH
146	Which of these is used for enzyme stabilization?			A	
	A	Potassium hydrogen phosphate	B		Sodium thiosulphate
	C	Calcium chloride	D		EDTA
147	The pH at which the net charge on the enzyme molecule is zero is called			C	
	A	pKa	B		Half-life
	C	Isoelectric point	D		Km



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148	Substances which reduce the rate of enzyme catalyzed reactions are known as			D	
	A	substrates	B		enzymes
	C	products	D		inhibitors
149	Which of the following is not an industrially important enzyme?			D	
	A	Pectinase	B		Cellulase
	C	Lysozyme	D		Arginase
150	Which of the following is the way of expressing enzyme activity by measuring the amount of enzyme that catalyzes the formation of one micromole of product in one minute under optimal conditions of pH, temperature and ionic strength?			D	
	A	Specific activity	B		Katal
	C	Turnover number	D		International unit
151	Which of the following is the number of units of enzyme activity per milligram of total protein present?			D	
	A	Katal	B		Turnover number
	C	International unit	D		Specific activity
152	Which of the following is not a method to stabilize a protein?			D	
	A	Immobilization techniques	B		Chemical modifications
	C	Addition of stabilizing compounds	D		Reducing hydrophobic residues
153	Which of the following cannot be used as an additive for stabilization of enzymes?			D	
	A	Sugars	B		Polyhydric alcohols
	C	Some organic solvents	D		Urea
154	Which of the following is the formula for pH calculation?			B	
	A	$\log_{10}[\text{H}^+]$	B		$-\log_{10}[\text{H}^+]$
	C	$\log_2[\text{H}^+]$	D		$-\log_2[\text{H}^+]$
155	Loss of activity which may be restored by the removal of inhibitor is referred to as _____			B	
	A	reversible inhibition	B		irreversible inhibition
	C	competitive inhibition	D		mixed inhibition
156	Mass spectrometers are used to determine which of the following?			C	
	A	Composition in sample	B		Concentration of elements in sample
	C	Relative mass of atoms	D		Properties of sample
157	In mass spectrometer, the sample that has to be analysed is bombarded with which of the following?			B	
	A	Protons	B		Electrons
	C	Neutrons	D		Alpha particles
158	Which of the following aids in the purification of recombinant proteins?			D	
	A	Introduction of "gaps"	B		Introduction of "random cuts"
	C	Introduction of "mutations"	D		Introduction of "Tags"
159	Which of the following is essential to keep separate the many pathways involving				



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	hundreds of enzymes, that function during metabolism?				
	A	Enzyme quantity	B	Enzyme concentration	D
	C	Enzyme purity	D	Enzyme specificity	
160	Mass spectrometer separates ions on the basis of which of the following?				
	A	Mass	B	Charge	D
	C	Molecular weight	D	Mass to charge ratio	
161	Which of the following represents the correct schematic of enzymatic reactions?				
	A	Enzyme-Product release → enzyme-substrate binding → catalysis	B	Enzyme-Product release → catalysis → enzyme-substrate binding	D
	C	Catalysis → enzyme-substrate binding → enzyme-Product release	D	Enzyme-substrate binding → catalysis → enzyme-Product release	
162	Which of the following is also called as immunoglobulin?				
	A	MHC molecules	B	Antibody molecules	B
	C	Fat molecules	D	Antigen molecules	
163	Which of the following class of antibody is the most common antibody and is present mostly in the blood and tissue fluids?				
	A	IgA	B	IgM	C
	C	IgG	D	IgE	
164	Which of the following is also known as catalytic antibodies?				
	A	Immunozymes	B	Abzymes	B
	C	Polyzymes	D	Ribozymes	
165	Which of the following enzymes finds no use in the textile industry?				
	A	Endonucleases	B	Lipases	A
	C	Cellulases	D	Catalases	
166	Which of the following enzyme hydrolyzes chitin?				
	A	Lipase	B	Lysozyme	B
	C	Endonuclease	D	Protease	
167	Which of the following technique is not used for Protein Engineering?				
	A	DNA shuffling	B	Error-prone PCR	C
	C	DNA fingerprinting	D	rDNA technology	
168	Which of the following involves mimicking or blocking the activity of enzymes or natural peptides upon the design and synthesis of metabolically stable peptide analogs?				
	A	Peptidomimetics	B	Carbamimetics	A
	C	Carcinomimetics	D	Auromimetics	
169	Which of the following are a combination of antibodies and lipocalins?				
	A	Lipobodies	B	Antibody-calins	C
	C	Anticalins	D	Lipobodies	



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170	Which of the following feature makes antibodies attractive drug candidates?			B	
	A	It being a glycoprotein	B		High target specificity
	C	Low target specificity	D		Catalytic efficiency
171	Which of the following technology has made it feasible to prepare large quantities of monoclonal antibodies (MAbs) with a defined antigen specificity?			A	
	A	Hybridoma technology	B		Southern blotting
	C	rDNA technology	D		PCR
172	Which of the following bonds help in the association of antibody H and L chains?			D	
	A	Ionic bonds	B		Hydrogen bonds
	C	Peptide bonds	D		Disulfide bonds
173	_____ is a divalent chelator which can be used to extract enzymes from different sources.			C	
	A	Sucrose	B		NaOH
	C	EDTA	D		Lysozyme
174	The phenomenon wherein the osmotic pressure created due to presence of solutes inside and outside the cells will be equal is referred to as _____			B	
	A	hypertonic condition	B		isotonic condition
	C	hypotonic condition	D		osmotic shock
175	Homogenization cannot be done by using which one of the following?			A	
	A	Ultrasonicator	B		French press
	C	Mortar and pestle	D		Homogenizer
176	The technique in which the cells are subjected to cold temperature of about $-15^{\circ}\text{C}$ to $-25^{\circ}\text{C}$ is referred to as _____			B	
	A	homogenization	B		freezing
	C	ultrasonics	D		osmotic shock
177	Increase or decrease in _____ leads to protonation or deprotonation of bases which leads to melting of DNA in turn isolating the enzyme after centrifugation.			C	
	A	temperature	B		ionic strength
	C	pH	D		detergent use
178	Purifications of purified proteins involved in small scale lab productions meant mainly for research purposes are referred to as _____			C	
	A	preparative purifications	B		chromatographic techniques
	C	analytical purifications	D		dialysis techniques
179	In a living organism, strong interactions between molecules are formed by which of the following bond?			B	
	A	Hydrogen bonding	B		Covalent bond
	C	Electrostatic interactions	D		Van der Waals forces
180	Which of these statements are TRUE for a glycosidic bond?			A	
	A	The bond between sugar and the nitrogenous base	B		The bond between the two sugar residues



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	C	The bond between sugar and phosphate	D	The bond between base and phosphate	
181	What is the term given to the supercoiling of circular DNA?				
	A	Twist number	B	Writhe number	B
	C	Cross-linking	D	Linking number	
182	Which of the following is also known as invert sugar?				
	A	Sucrose	B	Fructose	A
	C	Dextrose	D	Glucose	
183	Name the major storage form of carbohydrates in animals?				
	A	Cellulose	B	Chitin	D
	C	Starch	D	Glycogen	
184	What is the binding energy?				
	A	Free energy released in the formation of enzyme-substrate interaction	B	The energy required to form a bond	A
	C	The energy required to bind substrate	D	It is the activation energy	
185	What is the function of phosphorylase?				
	A	Transfer inorganic phosphate	B	Transfer a carboxylate group	A
	C	Use H <sub>2</sub> O <sub>2</sub> as the electron acceptor	D	Transfer amino group	
186	Which of the following equation shows the relationship between free energy change ( $\Delta G$ ) and the change in entropy ( $\Delta S$ ), under constant temperature and pressure?				
	A	$\Delta G = T\Delta H - \Delta S$	B	$\Delta G = T\Delta H/\Delta S$	D
	C	$\Delta G = \Delta H/T\Delta S$	D	$\Delta G = \Delta H - T\Delta S$	
187	Name the inhibition where end products of biosynthesis pathway inhibit the activity of the first enzyme?				
	A	Feedback inhibition	B	Feedback repression	A
	C	Allosteric inhibition	D	Competitive inhibition	
188	Which of the following is not a lipid-soluble photosynthetic pigment?				
	A	Carotenoids	B	Phycobilins	B
	C	Chlorophyll	D	Xanthophylls	
189	What is the total yield of ATP from complete oxidation of one molecule of glucose? monitor the progress of electrophoretic migration.				
	A	10	B	8	C
	C	32	D	40	
190	What is the site for gluconeogenesis?				
	A	Liver	B	Muscles	A
	C	Blood	D	Brain	
191	What is the final product of purine degradation in mammals?				



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	A   Guanine	B   Hypoxanthine	C
	C   Uric acid	D   Inosine	
192	Which of the following is not a component of a phospholipid?		
	A   Phosphate	B   Alcohol	D
	C   Glycerol	D   Protein	
193	Which of the following computational technique is best suited to study protein dynamics?		
	A   Molecular Dynamics Simulations	B   Molecular Docking	A
	C   Spatial Dynamics Simulations	D   Molecular Phylogenetics	
194	Which of the following is NOT Mendel's law of inheritance?		
	A   Law of dominance	B   Law of hetrozygous	B
	C   Law of segregation	D   Law of independent assortment	
195	Which enzyme join DNA molecules together?		
	A   Polymerase	B   Linkers	D
	C   Nucleases	D   Ligases	
196	Name the vector system used for plant transformation?		
	A   Agrobacterium	B   M13 phage	A
	C   Cosmids	D   Resistance plasmid	
197	Which of the following chemical is used in chemical transformation method?		
	A   Cu	B   FeSO <sub>4</sub>	C
	C   CaCl <sub>2</sub>	D   SO <sub>2</sub>	
198	What is the unit of a genetic map?		
	A   Centimeter	B   Centimorgan	B
	C   Nanometer	D   Angstrom	
199	What is the full form of RFLP?		
	A   Restriction Fragment Length Polymorphisms	B   Random Fragment Length Polymorphism	A
	C   Restriction Find in Length of DNA Polymer	D   Restriction Fragment Length Polymers	
200	The change in absorbance is used as the basis for assaying enzymes using _____		
	A   radioisotope method	B   biosensors	D
	C   luminescence method	D   spectrophotometer	