Total No. of Printed Pages : 21 (DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO) SET-Y **PHD-EE-2023-24 Bio-Technology Engineering** 10009Sr. No. Total Questions : 100 Time: 11/4 Hours Max. Marks : 100 Roll No. (in figures)_ (in words) _

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Theoretical plates are used to : 1.

A

- (1) Determine the thickness of the mobile phase
- (2) Determine the thickness of the stationary phase
- (3) Estimate the efficiency of the column
- (4) Measure the distribution of the analyte between mobile and stationary phases

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(6) Walking a contract of and water the W (6)

gamment (1)

(4) Mydrolysis

- 2. Which of the following condition is of reverse phase chromatography ?
 - (1) The mobile phase is non-polar and stationary phase is polar
 - (2) The mobile phase is polar and stationary phase is non-polar
 - (3) Both the mobile phase and stationary phase are organic
 - (4) Both the mobile phase and stationary phase are inorganic
- 3. What is rate-zonal centrifugation ?
 - (1) Based on separation of particles by mass
 - (2) Based on separation of particles by density
 - (3) Based on separation of particles on solubility
 - (4) Based on separation of particles on size
- Which of the follo What is the role of Argonaute proteins in RNA interference pathways? 4.
 - (1) They facilitate the processing of precursor miRNAs into mature miRNAs.
 - (2) They recognize and bind to specific siRNAs or miRNAs.
 - (3) They methylate DNA at specific CpG sites.
 - (4) They mediate histone acetylation and deacetylation.
- The inflatent lightly of an anique mariant to mainly in busided instant manual manual manual What do you mean by "Trophophase" ? 5.
 - (1) Production of waste materials
 - (2) Production of topical products
 - (3) Production of primary metabolites
 - (4) Production of secondary metabolites



- 2
- 6. Which of the following is an upstream process?

(1) Determine the the thekeness of the mobile phase

(1) Example the efficiency of the column

(2) Determine the thickness of the manonary phase

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- (1) Product recovery
- (2) Product purification
- (3) Media formulation
- (4) Cell lysis ben alidon nonated at long and to contrain the article at a mental (b)
- 7. In fed-batch culture, the feed solution is :
 - Less concentrated
 Highly concentrated
 Highly diluted
 Diluted
 Highly diluted</
- 8. Which one of the following is *not* included in the mechanism of bioleaching ?
 (1) Acidolysis
 (2) Complexolysis
 - (2) Based on separation of particles by density
 (3) Redoxolysis
 (4) Hydrolysis
 (4) Based on separation of particles on size
- 9. Which of the following has less organic matter load ?
 - (1) Marshlands
 - (2) Marine sediments
 (2) Marine sediments

(3) Landfill sites

(4) Fresh water

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(3) They methylate DNA an accelled of sheet

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- 10. The inherent ability of an animal to navigate towards an original location through unfamiliar areas.
 - (1) Homing
 - (2) Navigation
 - (3) Re-routing
 - (4) Walking

- Electrochemical biosensors that transduce the biological recognition events caused by electroactive species at the sensing surface into a current signal for the quantification of an analyte within a sample matrix.
 - (1) Amperometric
 (2) Dielectric
 (2) Dielectric
 - (3) Immuno (2) add (a) bin upor dollar series and an energy gridpedersoli (4)
 (4) Matrix

17. Which type of beareares configuration is requeally used for large and and and and

- 12. If screening is carried out on the basis of sequences which are related to the desired sequence, then the process is known as :
 - (1) in-silico

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- (2) homologue search
- (3) annotation

(3) selection

(4) partial search

(3) Furthad-bed interaction

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in Opdeed density meaning O

nearmannan vidadan'i (1)

TOTON STRAND PRI-TIA (L)

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- 13. Sometimes the required mRNA is present in less number. So the process of increasing the representation of rare mRNAs is known as :
 - (1) amplification (2) normalization
 - (4) narrowing

20. In marker-assisted breating, while a the pursue of the m

- 14. For cloning purposes, the intact chromosomes should be separated by :
 - (1) agarose gel electrophoresis
 - (2) fluorescence-activated sorter
 - (3) polyacrylamide gel electrophoresis
 - (4) chromatography
- 15. The process of examining stained chromosomes in a light microscope and removing appropriate regions with a micro-manipulator is called as :
 - (1) microdissection (2) chromosome sorting
 - (3) chromosome walking (4) chromosome jumping



16. What do we mean by housekeeping genes?

(1) Housekeeping genes are those genes which are specific to an organism

- (2) Housekeeping genes are those genes which are present in all the organisms
- (3) Housekeeping genes are those genes which are meant for repair and maintenance in a species of organism (2) Diesenre
- (4) Housekeeping genes are those genes which required for the replication process

What is the site of activ 21. (1) Bone marrow (2) Lymph nodes (3) Spleen (4) Thymus

Α

2.01230 (2)

1731 Arris (1)

(1) bomolousokers).

Which term describes 22.

- 17. Which type of bioreactor configuration is typically used for large-scale industrial production of microbial products ? 12. It screening is camed out on the basis of s
 - (1) Stirred tank bioreactor
 - (2) Air-lift bioreactor

4

- (3) Packed-bed bioreactor
- (4) Fluidized-bed bioreactor
- In bioprocess engineering, what is the primary purpose of a chemostat ? 18. (1) To maintain a constant concentration of substrate (2) To maintain a constant volume of culture (3) To measure the growth rate of microorganisms monaillaina (1) (4) To control temperature and pH noissa (L)
- the gene controlling th (1) Linkage equilibriu (2) Genome-wide ass (3) Linkage disequilil (4) Marker-trait assoc 23. What is the ratio of C (1) 1:2(2) 2:5(3) 2:1(4) 1:5 24. How do Natural Kille

- 19. Which of the following is not a commonly used method for measuring biomass concentration in a bioreactor ? ei) aganoss gel electrophoresis
 - (1) Turbidity measurement
 - (3) Optical density measurement

(2) Dry cell weight determination (4) Viscosity analysis

sequence, then the privess is known as :

- SPATTON (P) In marker-assisted breeding, what is the purpose of fine mapping ? 20. (1) To identify quantitative trait loci (QTLs) associated with complex traits (2) To refine the physical location of a gene of interest within a chromosome region (3) To analyze the genetic diversity within a population in histographic fin
 - (4) To assess the heritability of traits in different environments

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(1) By presence of N (2) By absence of M (3) By presence of N (4) By absence of N

- Which of these is no 25. (1) Self renewal (2) Differentiation
 - (3) Immortality
 - (4) Pluripotency

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- (1) Bone marrow
- (2) Lymph nodes
- (3) Spleen
- (4) Thymus

alies tar ist bar (1)

SVARSSIN SONA (1)

normaniant (C)

(3) Cell division

(2) Back (THE

Sets Stand The State State

(3) Monchybrid (2)

assi indennull.

anappines award (7)

(4) Hyperandians

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(4) ReaDORASSI (4)

14) Crossing over.

alter General (L)

alless strange (F)

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- Which term describes the phenomenon where a molecular marker is physically close to 22. the gene controlling the trait of interest? st Merilyas (1)
 - (1) Linkage equilibrium
 - (2) Genome-wide association
 - (3) Linkage disequilibrium
 - (4) Marker-trait association

23. What is the ratio of CD4⁺ cells to CD8⁺ cells ? (1) Test ernes

- (1) 1:2(2) 2:5
- (3) 2:1
- (4) 1:5
- 24. How do Natural Killer Cells recognize and kill the abnormal cells ? Addition H (1)
 - (1) By presence of MHC class I
 - (2) By absence of MHC class I
 - (3) By presence of MHC class II
 - (4) By absence of MHC class II
- 25. Which of these is not a property of stem cells ?
 - (1) Self renewal
 - (2) Differentiation
 - (3) Immortality
 - (4) Pluripotency



- 6
- Which of the following cells lack the ability to divide ? 26. domain saidt (1) (1) red blood cells
 - (2) muscle cells
 - (3) nerve cells
 - (4) All of the above

27. Loops in lampbrush chromosomes represent site of :

- (1) Replication
- (2) Transcription
- (3) Cell division
- (4) Crossing over

S para constant and mailling constants

(1) Linkage equilibrium

(2) Lynnin milles

ALTERNATION (6)

(D) 2 = 5

(3) 2:1

(4) 1.5

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- (2) Genome-wide assection
 - (1) Lonkage disequilibrium
 - (4) Marker-wait association

(2) By abarmade of MHIC class I

17) By presence of MHC class IF

Deales JIM in sposetic values (1).

Leven (198 (1)

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- How can it be determined whether the parent progeny is homozygous or heterozygous? 28. 23. What is the ratio of CDH cells to CDR cells. (1) Test cross $S \rightarrow I (1)$
 - (2) Back cross
 - (3) Monohybrid cross
 - (4) Reciprocal cross
- The expression of Holandric genes causes the following genetic trait : 29. How do Natoril Killer Calls recoamize and kill 101.20 (1) Haemophilia (1) By presence of MIRC class I

(2) Huntington's disease

(3) Down's syndrome

(4) Hypertrichosis

The DNA binding proteins bind at the : 30. 28. Which of these is not a property of stem cells

(1) Minor groove

(2) Major groove

(3) Phosphate molecules

(4) Pentose sugars

Sickle cell anaemia is a genetic disorder. Which of the following doesn't holds true for 31. it? (1) Chromman condonesticat

7

(2) Chromatin milanterion

modelydam AMG (f)

(4) RMA STRICTOR

(1) Enthaloy (H)

(2) Entropy (3)

Maintenper montantial (Fa

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(1) It can be analysed by PCR

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- (2) It destroys a restriction site
- The mutation is in alpha globulin gene (3)
- The conventional approach took weeks for the whole analyses to be carried out (4)
- Which as the fellow late is the salid s the minister period wollow and be don't 32. Which is the most predominant type of leukocytes in the blood stream ? (1) Neutrophils (2) Natural Killer Cells (3) Macrophages
- (A) Constitute up to 30% of all collate proteins Which thermodynamic principle states that the equilibrium constant (K) for a reaction 33. (4) All the above is related to the standard free energy change (ΔG°)?
 - (1) The law of mass action
 - Which theready manic quantity represents the near many useful (2) Hess's law biochemical reaction at constant tamparature and pressure ?
 - (3) The first law of thermodynamics
 - (4) The second law of thermodynamics
- The genetic relatedness between organisms can be identified by studying the band 34. patterns when different PCR products are analyzed electrophoretically. This method is
 - called as :
- (1) restriction fragment length polymorphism (RFLP) ability to generale tung a
 - (2) amplified fragment length polymorphism (AFLP)
 - (3) random amplification of polymorphic DNA (RAPD)
 - (4) polymorphism
 - 35. PCR amplification can be used for which type of samples ?
 - (1) Old samples only
 - (2) Recent samples only
 - (3) Equally to both recent and old samples
 - · (4) Recent samples are preferred but can be applied to old samples also



36. What is the primary consequence of histone acetylation on chromatin structure? Chromatin condensation (1)(1) It was be mady sed by P(R) (2) Chromatin relaxation sha nother by b and A (2) (3) DNA methylation (3) The mutation is in alpha alpha off (6) (4) RNA splicing (4) The conventional approach when the where in the whole analysis to ba carried out

What is the correct 41. (1) Bacteria, Virus (2) Fruit fly, Bacte (3) Human, Fruit f (4) Virus, Bacteria

A

- 37. Which of the following is true regarding the transmembrane proteins?
 - 32 Which is its most preduction type of it (1) They are drug targets or receptors
 - (2) They are responsible for performing a wide variety of important functions in a cell, such as signal transduction, cross-membrane transport, and energy conversion
 - (3) Constitute up to 30% of all cellular proteins 33. Which there out a new principle states that the RIP (10 111 10 1111) (4) All the above is related to the sandard free mergy change (1(i') ?
- Which thermodynamic quantity represents the maximum useful work obtainable from a 38. biochemical reaction at constant temperature and pressure ? T. a received with

() The first law of the main us

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HERITATION (2) (2)

and The second law of December of The

(1) Enthalpy (H)

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- (2) Entropy (S)
- (3) Helmholtz free energy (A)
- 34. The generate relatedances beiraren organisms can be (4) Gibbs free energy (G)
- 42. What do you think (1) Just genetic los (2) To avoid viabl (3) Helps in regula (4) Helps in genor Which factor can a 43. (1) Sample size (2) DNA extraction (3) Bioinformatic (4) All of the abo
- What is the purpo 44. (1) To estimate th (2) To normalize (3) To identify m (4) To quantify the 45. If a gene is inactiv (1) knock-in gen (2) knock-out ge (3) gene disrupti (4) insertional in PHD-EE-2023-24/(Bio-
- Which sequencing technology is commonly used for metagenomic studies due to its 39. ability to generate long reads and detect novel microbial species ?
 - (1) SOLiD sequencing
 - (2) Illumina sequencing
 - (3) Nanopore sequencing
 - (4) Pyrosequencing " addune to open inter to base of the monor of the second of the se
- (1) Oldering till (1) Which of the following is not a variant of BLAST? 40. · Ino - Signice Brand 190 (2) TBLASTNX (1) BLASTX as his of beingers ad an (4) BLASTN, sus soligenes a as I at (3) BLASTP PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(A)



What is the correct order for increasing gene density ? 41. (1) Bacteria, Virus, Fruit fly, Human (i) root induced, maine and (i) (2) Fruit fly, Bacteria, Virus, Human (2) minimum metanog, and minimum (2) (3) Human, Fruit fly, Bacteria, Virus (1) rumour in Jacon Stratt indunity (4) Virus, Bacteria, Fruit fly, Human

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47.

(2) Radio labeled segmencing

(4) Pyrosequencing

(i) Reall AD muinway

(2) RealBCD pairway

(3) RecABD pathway

(4) RecipCiB pacing (4)

(3) Real time Manteseence requencing

- What do you think is the requirement of Intergenic DNA in higher organisms ? 42. (1) Just genetic load (1) Chain terrochation sequencing
 - (2) To avoid viable mutations
 - (3) Helps in regulation of transcription
 - (4) Helps in genome organization
- 43. Which factor can affect the accuracy of metagenomic analysis ?
 - (1) Sample size

A

- (2) DNA extraction method
- (3) Bioinformatics software
- (4) All of the above
- What is the purpose of rarefaction analysis in metagenomics ? 44.
 - (1) To estimate the total number of species in a sample
 - (2) To normalize sequencing data for differences in sample size
 - (3) To identify microbial taxa with low abundance
 - (4) To quantify the functional diversity of microbial communities
- If a gene is inactivated by gene targeting then it is called as : 45. (1) Acetylation of arguines and photophonylation of three many
 - (1) knock-in gene
 - (2) knock-out gene
 - (3) gene disruption
 - (4) insertional inactivation in nound mains de los sointers to coincipas. (b)



(2) Acceptances en Iyanor and photophony hunon of theoremine

(3) Acetylanon of heare and pleased on state of an analysis at a count



(2) tumour inducing, root inducing
(3) tumour inducing, shoot inducing
(4) non-tumour inducing, shoot inducing

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(a) Relps in genonie on ean

- 47. Automated sequencing is defined as :
 - (1) Chain termination sequencing
 - (2) Radio labeled sequencing
 - (3) Real time fluorescence sequencing
 - (4) Pyrosequencing

10

- 48. What is the other name of DSB repair pathway?
 (1) RecBAD pathway
 (2) RecBCD pathway
 (3) RecABD pathway
 (4) RecDCB pathway
- (1 (2) (3) (4)

52.

54. Whic (1) R (2) Pr (3) pol

(3) Formation of a crossing over complex(4) The site of strand invasion

(1) The site of strand break

(2) The site of heteroduplex DNA formation

50. The most commonly observed modification in the histone includes :
(1) Acetylation of arginine and phosphorylation of threonine
(2) Acetylation of lysine and phosphorylation of threonine
(3) Acetylation of lysine and phosphorylation of serine
(4) Acetylation of arginine and phosphorylation of serine

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(4) All

55. When 18 these code
(1) univer
(2) synony
(3) overlap
(4) (1) and (

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and the second second

To which class of transcription factor do nuclear receptors belong? 51. (1) Helix-loop-helix proteins (i) 50.95m kmz 1239 36-2001 January

- (2) Leucine zipper proteins
- (3) Helix-turn-helix proteins
- (4) Zinc finger proteins
- 52. Which of the following chromosomal aberration shows pseudodominance? (1) Deletion (1) pseudomidine
 - (2) Duplication
 - (3) Inversions
 - (4) Translocation

minomi (1) enizonoba (E) (4) (1) and (2) are correct

(2) Fordmand (5)

(4) Owners is an interact

salstante) (E)

(1) 10-Mont long

and more (*)

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S.C.

- 53. What are protamines ? A labinita beauty mentaling and provide dainful .83 Elyconstation and the male in the male in a second (1) Large size DNA (1) Pectimese
 - (2) Sequences that are unique
 - (3) Histone like protein found in fish sperm
 - (4) Highly repetitive DNA
- 54. Which of the following about mRNA stability is correct? Manifer and many former (1) Regulation of mRNA stability is a way of regulating gene expression (2) Prokaryotic mRNAs have a half-life of only a few minutes (3) poly-A tails stabilize eukaryotic mRNAs (2) Personalized muridian () Dictary genousning (4) All of the above (4) Melubohanics 55. When 18 out of 20 amino acids have more than one codon to specify them, and manuscher 74 (1) (1) universal codons (7) Mildeland (S) (2) synonymous codons (7) Encloser e chan (3) overlapping codons mainternit (1)
 - (4) (1) and (2) are correct



12

The linear sequence (primary structure) of tRNAs is : 56. anishing riled anothing proteins (1) 60-95nt long andang oppis onished (S) (2) 30-40nt long anarma zilod-mus-zitold (fit (3) 10-30nt long (4) Zane finger proteins (4) 120-150nt long

What is DNA coated 61. (1) Silver (2) Aluminium (3) Gold (4) Calcium

A

A

- 57. There are many modified nucleosides present in tRNA structure, such as : (1) pseudouridine (1) Deledon (2) inosine (D) DISMARIAN (3) adenosine anounswill (E) (4) (1) and (2) are correct mais planar (+)
- 58. Which enzyme has significantly increased clinical activity after engineering more glycosylation sites into the protein? APRIL arge size DNAA
 - (1) Pectinase
 - (2) Erythropoietin
 - (3) Calmodulin
 - (4) Glucose isomerase

(2) Sequences that are unique (3) Histore like protein found in fish sperm ANCI avillagen vidade (A)

(3) poly-A tails stabilize enknryonc mRNAs

(1) averlagency enabers yaingalaova (1)

syrally sub to like (b)

(i) universal codens

analysis econorymetry (C)

(4) (1) and (2) any correction

59. Which term describes the field of nutrigenomics that focuses on identifying how

62. Which of these are r (1) Leucine and series (2) Lysine and gluta (3) Tryptophan and (4) Leucine and lys Which one of the fo 63. (1) Left-handed DN (2) Mostly found in (3) Only one deep, (4) All of the above 64. Which of the follow

individual genetic variations influence dietary responses and health outcomes ?

- (1) Nutritional epidemiology
- (2) Personalized nutrition
- (3) Dietary genotyping
- (4) Metabolomics

S5. When he can of 20 amino mids have shore than one codon to spacify them. S5. Which genera of microorganisms have the most diverse pathways for bioremediation? 60.

- (1) Pseudomonas
- (2) Rhodococcus
- (3) Escherechia
- (4) Methylobium

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- (1) N-acetylmuran (2) Sialic acid (3) Aminoglycosic (4) All of the abov 65. Which class of car (1) Monosacchari (2) Oisaccharides
 - (3) Polysaccharid (4) Oligosacchari

PHD-EE-2023-24/(Bio-7



What is DNA coated onto when transforming plant cells with a particle gun ? 61. (1) Silver (1) I include and head mill (2) Aluminium Asland Lines well() (S) (3) Gold 1)) I ann and my ang (4) Calcium and the simple man (+)

62.

13

- Which of these are rare amino acid in a protein ? (1) Leucine and serine (1) Karnid Eronandi rates
 - (2) Lysine and glutamic acid
 - (3) Tryptophan and methionine
 - (4) Leucine and lysine

A

noneinging in many 10 casel (4)

anos adapations and (?)

(3) Sinostorol

(4) Campagent

which and a life (1)

(2) Ability to produce atoms index molecules

- Which one of the following statement is correct for Z-DNA? 63. (1) Left-handed DNA (1) Ergnaltonol
 - (2) Mostly found in alternating purine-pyrimidine sequences
 - (3) Only one deep, narrow groove
 - (4) All of the above
- Which of the following amino sugar are present in the bacterial cell wall? 64.
 - (1) N-acetylmuramic acid
 - (2) Sialic acid
 - (3) Aminoglycoside
 - (4) All of the above

- () Saccharonnyedesent inter (2) Zyremannis multiplins (3) Sacrinengees uvanan (...) All of the upper
- Which class of carbohydrates is considered as non-sugar ? 65. (1) Monosaccharides enco de los redentradigies encortes as al significantes (1)
 - 12) the present into other to the look of the (2) Oisaccharides
 - (3) Polysaccharides drawing lies mail a sale of strategy a sharing a sharing (F)
 - (4) Oligosaccharides



66. Name the two essential fatty acids ?

(1) Linoleate and linolenate

(2) Oleic and linoleic

14

(3) Lauric and myristic

(4) Arachidonic and oleic

What is the prin 71. therapeutic genes (1) Immune respo (2) Vector integra (3) Transient tran (4) Promoter activ

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130 Starter

Burster (8)

Fall Calcium

With Oaky one deep, name groove

avoids and to it A. (M.

bias allait (L)

abizoovinouina (1)

(4) All of the above

(4) Olimosuccinarides

bing Structure (1) beer M (1)

continuenda (5)

Α

- 67. What is the primary advantage of using plant cell culture in industrial biotechnology? (1) Letterno and actine (1) Rapid growth rates blac aimetulg bins acier 3 (2) (2) Ability to produce complex molecules (4) Toppicpitan and methodine (3) Low production costs (4) Loucine and lysine (4) Ease of genetic manipulation.
- Which of the following sterol is present in the cell membrane of fungi? 68. AMCI bedraud-fial 11 (1) Ergosterol
 - a approximation formed in alternating partments and theold in (2) Stigmasterol
 - (3) Sitosterol
 - (4) Campesterol

72. What is the prima (1) To induce apo (2) To stimulate i (3) To silence en (4) To edit the ge What is the purpo 73. (1) To predict ge (2) To annotate g (3) To identify p (4) To quantify g success and house the

- Which of the following microorganisms help in the ethanol production ? 69.
 - (1) Saccharomyces cerevisiae
 - (2) Zygomonas mobilis
 - (3) Saccharomyces uvarum
 - (4) All of the above
- Antibiotics are typically produced in fed batch reactors because : 70. (1) antibiotic yields are generally higher when cells enter the stationary phase (2) the precursors are often toxic to the cells (2) Oand Charolics
 - (3) antibiotic yields are generally higher when cell growth slows
 - (4) All of the above

74.	Which algorithm
	(1) Clustal W
	(2) Smith-Water
	(3) Viterbi
	(4) PageRank
75.	Which of the foll
	(1) Smith-Water
	(2) Needleman-
	(3) BLAST algo
	(4) K-means clu
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292413 (1)

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The subset is some 1 (2"

Teaming of the second the loters

(2) Reduced environmental impact

(2) Limited availability of splectable markers

(4) Dans an outre manual (4)

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- What is the primary challenge associated with achieving long-term expression of 71. therapeutic genes in gene therapy ? plorts ber header the ender
 - (1) Immune response
 - (2) Vector integration
 - (3) Transient transgene expression
 - (4) Promoter activity

72. What is the primary objective of suicide gene therapy ?

- (1) To induce apoptosis in target cells
- (2) To stimulate immune responses against tumor cells
- (3) To silence endogenous genes
- (4) To edit the genome of target cells
- - (1) To predict gene expression patterns
 - (2) To annotate genes with functional information
 - (3) To identify protein-protein interactions
 - (4) To quantify gene expression levels

79. What is private dallangen generang angenic ann straft and the state Which algorithm is commonly used for multiple sequence alignment in bioinformatics ? 74.

- - (1) Clustal W
 - (2) Smith-Waterman
 - (3) Viterbi
 - (4) PageRank
- 86. Which of the tellowing a sugges is conquestly used for fire product. In the product. Which of the following is not a commonly used sequence alignment algorithm ? 75. (1) Fails some is a stand and the second of the
 - (1) Smith-Waterman algorithm
 - (2) Needleman-Wunsch algorithm
 - (3) BLAST algorithm
 - (4) K-means clustering algorithm



16

Which of the following is a commonly used gene in the development of transgenic 76. VUSION STUDY IN SOUSH STUDY WITH plants for herbicide resistance?

shorten sammel [] (1) EPSPS mainerpainingenet (E) (2) ACCase achiasangzo eneganero inconnuil' (E. (3) ALS VITATION CHORNER (F) (4) NOS

Which of the fol 81. biomedicine? (1) Production of r (2) Generation of a (3) Enhancement of (4) Xenotransplant

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- 77. The ligase enzyme from bacteriophage T4 uses : (2) ATP (1) $CaCl^2$ (4) NAD⁺ (3) Mn^{2+}
- Which of the following is a potential benefit of genetically modified (GM) insect-78. resistant transgenic plants ?

(3) To aslance endagemons romes

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(B) Vileen

(2) South-Waterman

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(3) To alcours protein-proton increduous

- (1) Increased use of chemical pesticides
- (2) Reduced environmental impact (1) To predict gene expression patterns (2) fo unotaic genes with innerional information (3) Enhanced biodiversity
- (4) Decreased crop yields
- (J) To quantly grane expression levels What is the primary challenge in generating transgenic animals compared to plants ? 79. (1) Inefficient gene transfer methods
- What is the primary 82. the production of b (1) Higher product (3) Easier purificat Which of the follow 83. (1) It is a site-speci (2) It is primarily u (3) It involves the u (4) It is not suitable Which of the foll 84. transgenic livestock

(2) Limited availability of selectable markers (3) Lack of suitable promoters for gene expression (4) Difficulty in culturing embryos in vitro

- Assand (V) Which of the following techniques is commonly used for the production of transgenic 80. animals ?in meeting in and a new planting of the many of the high of the double double of
 - (1) Embryonic stem cell manipulation
 - (2) Somatic cell nuclear transfer
 - multinostr do-mary accession (1) (3) Agrobacterium-mediated transformation
 - (4) Microinjection of DNA into oocytes

PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(A)

(1) Ethical concern (2) Limited availab (3) Regulatory rest (4) Difficulty in acl OTHIN HIT KEEDED ST What is the primary 85. (1) Risk of transmi (2) Incompatibility (3) Difficulty in ob (4) Lack of suitable PHD-EE-2023-24/(Bio-Te



- Which of the following is not a potential application of transgenic animals in 81. biomedicine ? estimation of the participation of the mail of the
 - (1) Production of recombinant proteins
 - (2) Generation of animal models for human diseases provide an income of the second (1)
 - (3) Enhancement of animal welfare
 - (4) Xenotransplantation

A

- What is the primary advantage of using transgenic animals over cell culture systems for 82. the production of biopharmaceuticals? (1) Protein statisters (1)
 - (1) Higher productivity ve binid (b)
 - (3) Easier purification methods
- (2) Lower production costs (4) Reduced risk of contamination

(1) Telefit system

ALSTING VERMORTAN (M)

GAVIST SCHORE ISSUED AVIA (F)

(d) Randominiparation of transferres

- 30. Which we note is a population for department of harmond substances in optical your Which of the following statements about the Cre-lox system is *true*? 83. P zlipo (1) It is a site-specific recombination system derived from bacteria. (2) It is primarily used for gene knockout in transgenic animals. (3) It involves the use of recombinases to remove DNA segments flanked by lox P sites. (4) It is not suitable for generating tissue-specific gene expression in transgenic animals.
 - Which of the following factors is a significant challenge in the development of 84. transgenic livestock? (1) To sonly day mutante and immedian of generates norman inf
 - (1) Ethical concerns regarding animal welfare (1) To analyze then the many lens of (1) (2) Limited availability of suitable host organisms (3) Regulatory restrictions on transgenic animal research (4) Difficulty in achieving germline transmission of transgenes
- ac. Which of the following recharges is used to identify proteins in a complete matter 85. What is the primary limitation of using transgenic animals for xenotransplantation ? (1) Risk of transmitting infectious diseases from animals to humans

 - (2) Incompatibility between animal and human immune systems
 - (3) Difficulty in obtaining sufficient numbers of transgenic animals
 - (4) Lack of suitable organs for transplantation



18

86. Which of the following techniques allows for the generation of inducible gene expression in transgenic animals?

zaistory tannichaouss to subsuber?] (1) (1) Tet-off system

(2) Constitutive promoters

nomenanamentions? (b)

(B) Enhancement of animal weifare (3) RNA interference (RNAi)

(4) Random integration of transgenes

91. Which of the followi (1) Competitive inhi (2) Allosteric inhibit (3) Irreversible inhib (4) Cooperative inhi

A

92. Which of the follow

- 87. What is the function of the nucleolus in eukaryotic cells ? (2) DNA replication (1) Protein synthesis (4) Lipid synthesis (3) Ribosome assembly (4) Redeated instead of communities (4) (3) Easter purchangen mained (8)
- 88. Which organelle is responsible for detoxification of harmful substances in eukaryotic cells ? Which of the following state ments about the Crevior watch of the fold of the Ea
 - (1) Golgi apparatus
 - (2) Peroxisomes
- (3) Lysosomes and the second mode to second mode to
 - (4) Endoplasmic reticulum
- 89. What is the primary purpose of comparative genomics ? (1) To study the structure and function of genomes across different species (2) To analyze gene expression patterns in response to environmental stimuli (3) To identify single nucleotide polymorphisms (SNPs) within a population (4) To investigate protein-protein interactions in cellular networks anagener lo mission of genetine generatine of transform of transgomes

- reaction under satura
- (1) Turnover number
- (3) Kcat

Sel: 261

- What is the primary a 93. traditional Sanger sec
 - (1) Higher accuracy (2) Lower cost per ba (3) Longer read leng
 - (4) Greater throughp
- Which of the fol owi 94. (CNV)?

- Which of the following techniques is used to identify proteins in a complex mixture 90. based on peptide sequences ?
 - (1) Enzyme-linked immunosorbent assay (ELISA)
 - (2) Polymerase chain reaction (PCR)
 - (3) Liquid chromatography-mass spectrometry (LC-MS)
 - (4) Microarray analysis

and such an integration of the manual of the second of the PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(A)

- (1) Single nucleotide (2) Insertions and del (3) Amplifications an (4) Translocations be
- Which technique is a 95. throughput manner ? (1) Yeast two-hybrid (2) Immunoprecipitat (3) Chromatin immur (4) RNA interference PHD-EE-2023-24/(Bio-Tech





Which of the following is not a type of enzyme inhibition? 91. .80 (1) Competitive inhibition and under the laboration descended (1 foreign autor) and a maximum into the A (1) (2) Allosteric inhibition (2) Norde (Special March (2) (3) Irreversible inhibition (C)ANTROLING ON CONSIDER STREED (C) (4) Cooperative inhibition (4) World Intellectual Pranty (Standard Line 4 (4)

Which of the following terms describes the maximum rate of an enzyme-catalyzed 92.

- reaction under saturating substrate concentrations?
 - (1) Turnover number

(3) Kcat

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(2) Michaelis constant (4) Allosteric constant

(ACTA) invitation A grat Lan Land (5)

1.34 (1)

AMMUNCHER (2)

- Ebime automobuses (1) 93. What is the primary advantage of next-generation sequencing (NGS) technologies over TO BUILT BOANSTER'S CH traditional Sanger sequencing?
 - (1) Higher accuracy (2) Lower cost per base pair and own de ser le sonnou i beingo logito
 - (1) Mathemati to establish formula (1) (3) Longer read lengths
 - (4) Greater throughput
- (C) (C) (C) (C) (C) (C) (C) (C) (C) Which of the following genomic alterations is associated with copy number variation 94. (CNV)?

- (1) Single nucleotide polymorphisms (SNPs)
- (2) Insertions and deletions (indels)
- (3) Amplifications and deletions of large genomic regions
- (4) Translocations between chromosomes
- 95. Which technique is commonly used to study protein-protein interactions in a high-(1) Yeast two-hybrid (Y2H) system

 - (2) Immunoprecipitation (IP)
 - (3) Chromatin immunoprecipitation (ChIP)
 - (4) RNA interference (RNAi)



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Which international organization oversees the enforcement of intellectual property 96. mound dui synthem () (1) rights related to biotechnological inventions?

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(1) Longer read length:

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- (1) World Health Organization (WHO)
- (2) World Trade Organization (WTO)
- (3) Food and Agriculture Organization (FAO)
- (4) World Intellectual Property Organization (WIPO)
- Which of the following terms describes the maximum rate of an enzyme-cathyrad 97. Which of the following accumulates from factory waste?
 - (1) Pseudomonas aeruginosa
 - (2) Thiobacillus
 - (3) Pseudomonas putida
 - (4) Zoogloea ramigera
 - Which organization is responsible for establishing guidelines and regulations for the 98. ethical conduct of biomedical research involving human subjects ?
 - (1) National Institutes of Health (NIH)
 - (2) Food and Drug Administration (FDA)
 - (3) World Health Organization (WHO)
 - (4) UNESCO International Bioethics Committee
 - What is the role of Institutional Biosafety Committees (IBCs) in research institutions ? 99.
 - (1) To oversee the enforcement of intellectual property rights (2) To regulate the ethical conduct of biomedical research (3) To ensure compliance with biosafety regulations and guidelines (4) To promote public awareness of biotechnological innovations
- RNA domain that binds a ligand, causing a change in secondary structure of the RNA, 100. thus affecting gene expression. (1) tRNA
 - (3) microRNA
- (2) Aptamer (4) Antisense RNA (A.V.M.) o marshesten / Mal (A.)

Total No. of Printed Pages : 21 (DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO) SET-Y PHD-EE-2023-24 Bio-Technology Engineering 10010 Sr. No. Time : 1¼ Hours Max. Marks : 100 Total Questions : 100 Roll No. (in figures) (in words) Total Questions : 100

_____ Date of Birth.

Name

Father's Name _____

Mother's Name

Date of Examination_

(Signature of the Candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

- 2. The candidates *must return* the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
- 5. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

PHD-EE-2023-24/(Bio-Tech. Engg.)(SET-Y)/(B)

- 1. What is the correct order for increasing gene density ?
 - (1) Bacteria, Virus, Fruit fly, Human
 - (2) Fruit fly, Bacteria, Virus, Human
 - (3) Human, Fruit fly, Bacteria, Virus
 - (4) Virus, Bacteria, Fruit fly, Human
- 2. What do you think is the requirement of Intergenic DNA in higher organisms ?(1) Just genetic load
 - (2) To avoid viable mutations
 - (3) Helps in regulation of transcription
 - (4) Helps in genome organization
- 3. Which factor can affect the accuracy of metagenomic analysis ?
 - (1) Sample size

B

- (2) DNA extraction method
- (3) Bioinformatics software
- (4) All of the above

(2) Rec SCD pathway
(3) Rec MBD pathway
(4) Rec MBD pathway

Yourding CLARDON (1)

(iii) Pyrmsequencing

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(2) Ratio inbaled and months (2)

ean monthemake inducing, shoot inducing

(3) Real turns Rundissional sequencies (P)

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- 4. What is the purpose of rarefaction analysis in metagenomics ?
 - (1) To estimate the total number of species in a sample
 - (2) To normalize sequencing data for differences in sample size
 - (3) To identify microbial taxa with low abundance

(4) To quantify the functional diversity of microbial communities

- 5. If a gene is inactivated by gene targeting then it is called as :
 - (1) knock-in gene
 - (2) knock-out gene
 - (3) gene disruption
 - (4) insertional inactivation

6. Agrobacterium tumefaciens and Agrobacterium rhizogenes form :
(1) root inducing, tumour inducing
(2) tumour inducing, root inducing
(3) tumour inducing, shoot inducing
(4) non-tumour inducing, shoot inducing

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(B) anime distruggion (B)

- 7. Automated sequencing is defined as :
- bed manage tent (1) (1) Chain termination sequencing anoitemm alduity binars of (E) (2) Radio labeled sequencing (3) Real time fluorescence sequencing (4) Halps in genonia erganization (4) Pyrosequencing What is the other name of DSB repair pathway? 8. (I) Sample size (1) RecBAD pathway DNA extraction method (2) RecBCD pathway (3) Biomiomonaucs software (3) RecABD pathway (4) RecDCB pathway service sile to UA (4)
- 9. What is the holiday junction ?
 (1) The site of strand break
 - (2) The site of heteroduplex DNA formation
 - (3) Formation of a crossing over complex
 - (4) The site of strand invasion
- 10. The most commonly observed modification in the histone includes :
 - (1) Acetylation of arginine and phosphorylation of threonine
 - (2) Acetylation of lysine and phosphorylation of threonine
 - (3) Acetylation of lysine and phosphorylation of serine
 - (4) Acetylation of arginine and phosphorylation of serine

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11. What is the primary challenge associated with achieving long-term expression of therapeutic genes in gene therapy ?

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resistant transpenic plants?

- (1) Immune response
- (2) Vector integration
- (3) Transient transgene expression
- (4) Promoter activity
- 12. What is the primary objective of suicide gene therapy ?
 - (1) To induce apoptosis in target cells
 - (2) To stimulate immune responses against tumor cells
 - (3) To silence endogenous genes
 - (4) To edit the genome of target cells
- 13. What is the purpose of gene ontology (GO) in bioinformatics ?
 (1) To predict gene expression patterns
 (2) To annotate genes with functional information
 (3) To identify protein-protein interactions
 (4) To quantify gene expression levels
- 14. Which algorithm is commonly used for multiple sequence alignment in bioinformatics ?

(3) Lack of suitable provolary in gene expression

(4) Dalitically in culturing endryds in vitro

- (1) Clustal W
 - (2) Smith-Waterman
- (3) Viterbi
- (4) PageRank
- 15. Which of the following is *not* a commonly used sequence alignment algorithm ?
 (1) Smith-Waterman algorithm
 (2) Needleman-Wunsch algorithm
 (3) BLAST algorithm
 (4) K-means clustering algorithm

Which of the following techniques is commonly used for the preduction of beams and



16. Which of the following is a commonly used gene in the development of transgenic brent and concern print and and plants for herbicide resistance? Benos established (1) EPSPS (a) Version miceraly (5) (2) ACCase

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- (S) Dansten panstene en pression (3) ALS vier de la maighter et (4) (4) NOS
- The ligase enzyme from bacteriophage T4 uses : 17. (2) ATP (1) $CaCl^2$ (4) NAD^{*} and the later of the statement of the statemen (3) Mn^{2+} (3) The efforted adoption of (8)
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 - (1) Increased use of chemical pesticides
 - (2) Reduced environmental impact
 - (2) To simulate genes with functional information (3) Enhanced biodiversity
 - (4) Decreased crop yields

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(4) to cautiny scae capacity (4) What is the primary challenge in generating transgenic animals compared to plants ?

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- 19. (1) Inefficient gene transfer methods
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- Which of the following techniques is commonly used for the production of transgenic 20. the source of the following is will a community used sequence all manners animals?
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 - (3) Agrobacterium-mediated transformation
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21. Which of the following is *not* a type of enzyme inhibition ?

- (1) Competitive inhibition
- (2) Allosteric inhibition
- (3) Irreversible inhibition
- (4) Cooperative inhibition

(3) Food and Agriculture (Degranoution (FAD)

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- 22. Which of the following terms describes the maximum rate of an enzyme-catalyzed reaction under saturating substrate concentrations ?
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 - (3) Kcat

- (2) Michaelis constant
- (4) Allosteric constant
- 23. What is the primary advantage of next-generation sequencing (NGS) technologies over traditional Sanger sequencing ?
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 - (3) Amplifications and deletions of large genomic regions

(4) Translocations between chromosomes

- 25. Which technique is commonly used to study protein-protein interactions in a high-throughput manner ?
 - (1) Yeast two-hybrid (Y2H) system
 - (2) Immunoprecipitation (IP)
 - (3) Chromatin immunoprecipitation (ChIP)
 - (4) RNA interference (RNAi)

Which international organization oversees the enforcement of intellectual property 26. rights related to biotechnological inventions ? nuitidinini ty history (1)

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- (1) World Health Organization (WHO)
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(2) To regulate the ethical conduct of biomedical research

(3) To ensure compliance with biosafety regulations and guidelines

(4) To promote public awareness of biotechnological innovations ADDA OF DEED AN

RNA domain that binds a ligand, causing a change in secondary structure of the RNA, 30. thus affecting gene expression. DEPENDENCE Y DEPENDED - OFFICIA

(1) tRNA (2) Aptamer (3) microRNA (4) Antisense RNA

Theoretical plates are used to : 31.

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(1) Product recurrent

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(3) Landfill sites

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- (1) Determine the thickness of the mobile phase
- (2) Determine the thickness of the stationary phase
- (3) Estimate the efficiency of the column
- (4) Measure the distribution of the analyte between mobile and stationary phases
- d-bot al Which of the following condition is of reverse phase chromatography? 32. (1) The mobile phase is non-polar and stationary phase is polar

 - (2) The mobile phase is polar and stationary phase is non-polar
 - (3) Both the mobile phase and stationary phase are organic
 - (4) Both the mobile phase and stationary phase are inorganic
- What is rate-zonal centrifugation ? 33.
 - (1) Based on separation of particles by mass
 - (2) Based on separation of particles by density
 - (3) Based on separation of particles on solubility
 - (4) Based on separation of particles on size
- Which of the following handless meaner matte What is the role of Argonaute proteins in RNA interference pathways? 34.
 - (1) They facilitate the processing of precursor miRNAs into mature miRNAs.
 - They recognize and bind to specific siRNAs or miRNAs. (2)
 - (3) They methylate DNA at specific CpG sites.
 - (4) They mediate histone acetylation and deacetylation.
- is a final subscript ability of an antino many say to an an an inclusion to an an analisi of the other What do you mean by "Trophophase" ? 35.
 - (1) Production of waste materials
 - (2) Production of topical products
 - (3) Production of primary metabolites
 - (4) Production of secondary metabolites

- **36.** Which of the following is an upstream process ?
 - (1) Product recovery starting bladets and to starting all mit starting of the

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- (2) Product purification
- (3) Media formulation
- (4) Cell lysis
- 37. In fed-batch culture, the feed solution is :(1) Less concentrated
 - (2) Highly concentrated
 (3) Highly diluted
 (4) Diluted
- 38. Which one of the following is not included in the mechanism of bioleaching ?
 (1) Acidolysis
 (2) Complexolysis
 (3) Redoxolysis
 (4) Hydrolysis
- 39. Which of the following has less organic matter load ?
 (1) Marshlands
 (2) Marine sediments
 - (2) They consider and burd to spinally su on MMANS

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(3) Landfill sites(4) Fresh water

- 40. The inherent ability of an animal to navigate towards an original location through unfamiliar areas.
 - (1) Homing
 - (2) Navigation
 - (3) Re-routing
 - (4) Walking

- в
 - To which class of transcription factor do nuclear receptors belong ? 41. 46. The Needr

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2001 m20-03 (1)

(1) 10-30mt long

(4) 120-150m kong

(3) Dietary genolygalog

(4) Meishaduman

(1) Presidomanas

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munched with the (1)

- (1) Helix-loop-helix proteins
 - (2) Leucine zipper proteins and inits (C) 30-40m Long
 - (3) Helix-turn-helix proteins
 - (4) Zinc finger proteins
- Which of the following chromosomal aberration shows pseudodominance ? 42. (1) pseudonomiane (1) Deletion (2) inoside (2) Duplication (3) adanosine (3) Inversions (4) (1) and (2) are correct (4) Translocation 43. What are protamines ? glyconvation sites into the protein (1) Large size DNA 11) Pectinase (2) Erjsturopoiet.a (2) Sequences that are unique (3) Histone like protein found in fish sperm (J) Calmodulin (4) Highly repetitive DNA 14) Glucose Bonnerase Which of the following about mRNA stability is correct ? 44. (1) Regulation of mRNA stability is a way of regulating gene expression
 - (2) Prokaryotic mRNAs have a half-life of only a few minutes
 - (3) poly-A tails stabilize eukaryotic mRNAs (2) Personal transformed (2)

(4) All of the above

- When 18 out of 20 amino acids have more than one codon to specify them, and 45. these codon referred as :
 - (1) universal codons
 - (2) synonymous codons
 - (3) overlapping codons
 - (4) (1) and (2) are correct

10

The linear sequence (primary structure) of tRNAs is : 46. enionen ritert met-alleli (11) (1) 60-95nt long (2) 30-40nt long animant togets support interins Z WEWAY (3) 10-30nt long (3) Holix-rum-helix proteins (4) 120-150nt long (4) Zine Inger proteins

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- 47. There are many modified nucleosides present in tRNA structure, such as : (1) Desenon (1) pseudouridine (2) Duplication (2) inosine (3) adenosine (3) bayenarch (E) (4) (1) and (2) are correct milisopians [[]
- Which enzyme has significantly increased clinical activity after engineering more 48. glycosylation sites into the protein ? (I) Large size DYSA

(2) Sequences that are unique.

(4) Highly repetitive DNA

prode salt to IIA (44)

(3) Misterne like protein found in lish spenn

(D) poly-A tails stabilize subaryonic mRNAs

- (1) Pectinase
- (2) Erythropoietin
- (3) Calmodulin
- (4) Glucose isomerase
- Which term describes the field of nutrigenomics that focuses on identifying how 49. individual genetic variations influence dietary responses and health outcomes ?
 - (1) Nutritional epidemiology
 - (2) Personalized nutrition
 - (3) Dietary genotyping
- (4) Metabolomics bes main through of shows and three and the start one in the and the start of the start of the start and
 - Which genera of microorganisms have the most diverse pathways for bioremediation ? 50. (D) aniversal colon. (1) Pseudomonas anaboa manyaana (S) (2) Rhodococcus (3) Escherechia List onertainstatick indonts (4) Methylobium HAN IT , and (2) and (N) whi



What is DNA coated onto when transforming plant cells with a particle gun? (1) Silver (2) Aluminium

(2) Oisic and lineoleic

11

- (3) Lauric and myristic
- (4) Amchidanic and oleic
- Which of these are rare amino acid in a protein ? 52. (1) Leucine and serine (1) Raphi amarch mice (2) Lysine and glutamic acid (2) Ability to produce complex molecules (3) Tryptophan and methionine (3) Low production costs (4) Leucine and lysine (4) Fase of genetic manipulation. Which one of the following statement is correct for Z-DNA? 53. (1) Left-handed DNA ATT Ergusterra (2) Mostly found in alternating purine-pyrimidine sequences (2) Sugmation (3) Side dans (3) Only one deep, narrow groove
 - (4) All of the above
- 54. Which of the following amino sugar are present in the bacterial cell wall?
 - (1) N-acetylmuramic acid
 - (2) Sialic acid

В

51.

(3) Gold

(4) Calcium

(3) Aminoglycoside(4) All of the above

(3) Saccharomyces us and

(1) the break and and white and the cells

(2) Zepanesmay 5 (2)

(4) AU of the above .

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(1) Sand an and an and an and an and and

- 55. Which class of carbohydrates is considered as non-sugar ?
 - (1) Monosaccharides mene alles medw reduid eller mese sus delar, shohdinm (1)
 - (2) Oisaccharides
 - (3) Polysaccharides warm fins and a ranged ellerandog are chiney subscribes of
 - (4) Oligosaccharides

Name the two essential fatty acids ? 56.

(1) Linoleate and linolenate

(2) Oleic and linoleic

(3) Lauric and myristic

(4) Arachidonic and oleic

57. What is the primary advantage of using plant cell culture in industrial biotechnology?

В

(1) Sulver

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(1) Louising and same

(4) Lewine and Waine

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12) Lysine and giulamic acid

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- (1) Rapid growth rates
- (2) Ability to produce complex molecules
- (3) Low production costs
- (4) Ease of genetic manipulation.
- Which of the following sterol is present in the cell membrane of fungi ? 58. (1) Ergosterol AACI babaul real 11
 - (2) Monty Fund in alternating parine-pyrimidine sequences (2) Stigmasterol
 - (3) Sitosterol
 - (4) Campesterol
- Which of the following microorganisms help in the ethanol production ? 59. the state of the second state west and the state of the s (1) Saccharomyces cerevisiae
 - (2) Zygomonas mobilis
 - (3) Saccharomyces uvarum
 - (4) All of the above

IN MARRIER PROPERTY

Antibiotics are typically produced in fed batch reactors because : 60. (1) antibiotic yields are generally higher when cells enter the stationary phase (2) the precursors are often toxic to the cells approximation of a fight (3) antibiotic yields are generally higher when cell growth slows (4) All of the above and consequences and

What is the site of activation and differentiation of B-cells? 61. (1) Bone marrow allow be to ber (1) (2) Lymph nodes

(3) Spleen

В

(4) Thymus

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13

- Which term describes the phenomenon where a molecular marker is physically close to 62. the gene controlling the trait of interest? (1) Replication
- (1) Linkage equilibrium (2) Transmption (2) Genome-wide association noisivit Uso (E) (3) Linkage disequilibrium (4) Crussing over (4) Marker-trait association 63. What is the ratio of CD4⁺ cells to CD8⁺ cells ? (i) Test cross (1) 1:2(2) Back (TOSS (2) 2:5 the tip I so could be for the Fi) Monoightid arous (3) 2:1(4) Recipition Charles (4) 1:5 64. How do Natural Killer Cells recognize and kill the abnormal cells ? (1) Harristing (1) By presence of MHC class I (1) Hantington's discuse (2) By absence of MHC class I (I) Down a stadtement

(3) By presence of MHC class II (4) By absence of MHC class II

Which of these is not a property of stem cells ? 65.

- (1) Self renewal
- (2) Differentiation
- (3) Immortality
- (4) Pluripotency

14

Which of the following cells lack the ability to divide ? 66.

- (1) red blood cells
- (2) muscle cells
- (3) nerve cells
- (4) All of the above
- 67. Loops in lampbrush chromosomes represent site of : and to heat the gentloning on a sul (1) Replication
 - (2) Transcription
 - (3) Cell division
 - (4) Crossing over

muhdiliops section (1) (2) Genomo-mode askociation (3) Linkage disequilibrian (4) Marker-wait association

(2) By able to MHC 2 ass 1

Useria JHM to consend of MIRC class U

(4) B sheenee of MBC class B

(2) Defectentiation

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(2) 2:5

1:11:2:11

141 1 . 5

B

- How can it be determined whether the parent progeny is homozygous or heterozygous ? 68. (1) Test cross 5:1 (1)
 - (2) Back cross
 - (3) Monohybrid cross
 - (4) Reciprocal cross
- The expression of Holandric genes causes the following genetic trait : 69. (1) Haemophilia (1) By present of MHC class J

(2) Huntington's disease (3) Down's syndrome (4) Hypertrichosis

- The DNA binding proteins bind at the : 70. (1) Minor groove
 - (2) Major groove
 - (3) Phosphate molecules
 - (4) Pentose sugars
Electrochemical biosensors that transduce the biological recognition events caused by

(2) attrite building with a building (2)

131 Facked-bed birgeretor

(4) Fluidized-bod biorcacion

- electroactive species at the sensing surface into a current signal for the quantification of an analyte within a sample matrix.
 - (2) Illou electron page are these genes which are present an all the organism (2) Amperometric
 - (1) Amperometric (2) Dielectric
 - (3) Immuno par all rol bampor deader sones acoult me concy and postocial (4)
 - (4) Matrix

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71.

The Which type at the configuration to ally the the state of a delay the state of a delay the 72. If screening is carried out on the basis of sequences which are related to the desired sequence, then the process is known as :

ALL ANTINE TRANSPORT

- (1) in-silico
- (2) homologue search
- (3) annotation
- (4) partial search
 - In bioprocess any instants of a discourse in a straining of a chemister of a chemister of 18.

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- Sometimes the required mRNA is present in less number. So the process of increasing 73. the representation of rare mRNAs is known as :
 - emainagroom (2) normalization all surgers of (2) (1) amplification (4) narrowing (3) selection the second second
- 74. For cloning purposes, the intact chromosomes should be separated by : 19. (1) agarose gel electrophoresis
 - (2) fluorescence-activated sorter
 - (3) polyacrylamide gel electrophoresis
- (3) Optical Jensity models argun
- (4) chromatography 80. In marking which he will be the part of the other with the second of the part of the second of t
- The process of examining stained chromosomes in a light microscope and removing 75. appropriate regions with a micro-manipulator is called as :
 - (1) microdissection (2) chromosome sorting
 - (3) chromosome walking (4) chromosome jumping
- PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(B) P. T. O.

- 76. What do we mean by housekeeping genes ?
- (1) Housekeeping genes are those genes which are specific to an organism
 - (2) Housekeeping genes are those genes which are present in all the organisms
 - (3) Housekeeping genes are those genes which are meant for repair and maintenance in a species of organism
 - (4) Housekeeping genes are those genes which required for the replication process
- 77. Which type of bioreactor configuration is typically used for large-scale industrial production of microbial products ?

THEN (1)

collised (1)

domess appolornoid (C)

(4) named scarch

(1) amphilication

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- (1) Stirred tank bioreactor
- (2) Air-lift bioreactor
- (3) Packed-bed bioreactor
- (4) Fluidized-bed bioreactor
- 78. In bioprocess engineering, what is the primary purpose of a chemostat ?
 - (1) To maintain a constant concentration of substrate
 - (2) To maintain a constant volume of culture
 - (3) To measure the growth rate of microorganisms
 - (4) To control temperature and pH
- **79.** Which of the following is *not* a commonly used method for measuring biomass concentration in a bioreactor ?
 - (1) Turbidity measurement
 - (3) Optical density measurement
- (2) Dry cell weight determination(4) Viscosity analysis

sequence, then the process is known as :

80. In marker-assisted breeding, what is the purpose of fine mapping ?

To identify quantitative trait loci (QTLs) associated with complex traits
To refine the physical location of a gene of interest within a chromosome region
To analyze the genetic diversity within a population
To assess the heritability of traits in different environments

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- 17
- 81. Which of the following is not a potential application of transgenic animals in biomedicine ?
 - (1) Production of recombinant proteins
 - (2) Generation of animal models for human diseases
 - (3) Enhancement of animal welfare
 - (4) Xenotransplantation

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82.

- What is the primary advantage of using transgenic animals over cell culture systems for
- the production of biopharmaceuticals ?
- (1) Higher productivity
- (3) Easier purification methods
- (2) Lower production costs(4) Reduced risk of contamination

the Readon in the non-shall in the book of the

(1) Tel-off System

(3) RNA Interference (RNAi)

- 83. Which of the following statements about the Cre-lox system is *true*?
 (1) It is a site-specific recombination system derived from bacteria.
 (2) It is primarily used for gene knockout in transgenic animals.
 (3) It involves the use of recombinases to remove DNA segments flanked by lox P sites.
 (4) It is not suitable for generating tissue-specific gene expression in transgenic animals.
 - 84. Which of the following factors is a significant challenge in the development of transgenic livestock ?
 - (1) Ethical concerns regarding animal welfare
 (2) Limited availability of suitable host organisms
 (3) Regulatory restrictions on transgenic animal research
 (4) Difficulty in achieving germline transmission of transgenes
- 85. What is the primary limitation of using transgenic animals for xenotransplantation ?
 - (1) Risk of transmitting infectious diseases from animals to humans
 - (2) Incompatibility between animal and human immune systems
 - (3) Difficulty in obtaining sufficient numbers of transgenic animals
 - (4) Lack of suitable organs for transplantation

PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(B)

- 86. Which of the following techniques allows for the generation of inducible gene expression in transgenic animals? ne où bornovi
 - (1) Tet-off system
 - (2) Constitutive promoters
 - (3) RNA interference (RNAi)
 - (4) Random integration of transgenes

(4) Reduced rished contamination

87. What is the function of the nucleolus in eukaryotic cells ? (2) DNA replication (1) Protein synthesis

- (3) Ribosome assembly

(1) Preshauca st recombingant promities

onsiless human to manual wallard. (E)

(A) Basic reaction and the second of (A)

- (4) Lipid synthesis
- 88. Which organelle is responsible for detoxification of harmful substances in eukaryotic cells ?
 - (1) Golgi apparatus
 - (2) Peroxisomes
- (3) Lysosomes (4) Endoplasmic reticulum SLETT
- 89. What is the primary purpose of comparative genomics ? (1) To study the structure and function of genomes across different species (2) To analyze gene expression patterns in response to environmental stimuli (3) To identify single nucleotide polymorphisms (SNPs) within a population (4) To investigate protein-protein interactions in cellular networks 建筑政治 ((1) (4) Difficulty in achieving secondine mainskip of transmission (4)
- Which of the following techniques is used to identify proteins in a complex mixture 90. based on peptide sequences ?
 - (1) Enzyme-linked immunosorbent assay (ELISA)
 - (2) Polymerase chain reaction (PCR)
 - (3) Liquid chromatography-mass spectrometry (LC-MS)
 - (4) Microarray analysis

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(1) Chromean coalensations

(2) Chromania relations)

(3) Dhamenhilainn

(1) reprint (1)

(2) Enviry (3)

Amonganica sugaranal (E)

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100. Which is the following is not a variant of BLAST?

- Sickle cell anaemia is a genetic disorder. Which of the following doesn't holds true for 91. it?
 - (1) It can be analysed by PCR
 - (2) It destroys a restriction site
 - (3) The mutation is in alpha globulin gene
 - (4) The conventional approach took weeks for the whole analyses to be carried out

B

- 92. Which is the most predominant type of leukocytes in the blood stream ? (2) Natural Killer Cells (1) Neutrophils (3) Macrophages (4) Monocytes
 - 93. Which thermodynamic principle states that the equilibrium constant (K) for a reaction is related to the standard free energy change (ΔG°)? sports and the alarment
 - (1) The law of mass action
- 88. Which thermodynamic quantity represents the maximum useful work shill (2) Hess's law
 - biochernical reaction at constant temperature and pressure (3) The first law of thermodynamics
 - (4) The second law of thermodynamics
 - The genetic relatedness between organisms can be identified by studying the band 94. patterns when different PCR products are analyzed electrophoretically. This method is called as :
- (1) restriction fragment length polymorphism (RFLP) (2) amplified fragment length polymorphism (AFLP)
 - (3) random amplification of polymorphic DNA (RAPD) (2) filmmins sequencing
 - (4) polymorphism
 - 95. PCR amplification can be used for which type of samples ?
 - (1) Old samples only
 - (2) Recent samples only
 - (3) Equally to both recent and old samples
 - (4) Recent samples are preferred but can be applied to old samples also

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96. What is the primary consequence of histone acetylation on chromatin structure ?

- (1) Chromatin condensation
- (2) Chromatin relaxation
- (3) DNA methylation
- (4) RNA splicing
- 97. Which of the following is true regarding the transmembrane proteins?(1) They are drug targets or receptors
 - (2) They are responsible for performing a wide variety of important functions in a cell, such as signal transduction, cross-membrane transport, and energy conversion

11) It can be enalysed by PCR

Stia montaria Si a avenuatent (1)

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- (3) Constitute up to 30% of all cellular proteins
- (4) All the above
- **98.** Which thermodynamic quantity represents the maximum useful work obtainable from a biochemical reaction at constant temperature and pressure ?
 - (1) Enthalpy (H)
 - (2) Entropy (S)

Ismail.

- (3) Helmholtz free energy (A)
- (4) Gibbs free energy (G)
 - **99.** Which sequencing technology is commonly used for metagenomic studies due to its ability to generate long reads and detect novel microbial species ?
 - (1) SOLiD sequencing
- 100. Which of the following is *not* a variant of BLAST ?
 (1) BLASTX
 (2) TBLASTNX
 (3) BLASTP
 (4) BLASTN
- PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(B)

- (4) Pyrosequencing
- (3) Nanopore sequencing
- (2) Illumina sequencing

Total No. of Printed Pages : 21

Sr. No.

10011

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO) SET-Y **PHD-EE-2023-24 Bio-Technology Engineering**

Time : 11/4 Hours	Max. Marks : 100	Total Questions : 100
Roll No. (in figures)	(in words)	
Name	Date of Birth	

Father's Name _____ Mother's Name ____

Date of Examination

(Signature of the Candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfairmeans / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.

- 5. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

PHD-EE-2023-24/(Bio-Tech. Engg.)(SET-Y)/(C)

- What is the site of activation and differentiation of B-cells ? 1.
 - (1) Bone marrow all to braid ten (1)
 - (2) Lymph nodes
 - (3) Spleen

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- (4) Thymus
- Which term describes the phenomenon where a molecular marker is physically close to 2. the gene controlling the trait of interest? (1) Replication
 - (1) Linkage equilibrium
 - (2) Genome-wide association
 - (3) Linkage disequilibrium
 - (4) Marker-trait association

(2) Transcription noisivib 1150 (C) (4) Crossing over

(3) DORDI'S SYNCHOME.

(ii) Mypererichesis

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- S. How can it be determined whether the resent process is however it end the Bulling being of the struggering the What is the ratio of CD4⁺ cells to CD8⁺ cells ? 3. AND TON COURS
 - (1) 1:2inter an inter dente divisionenter (2) Back cross
 - (2) 2:5(3) Monobyinid cross (3) 2:1A. Well, and in the Aller A. (4) Reciprocel cruss

(2) Hentingron's discuss? 'sell' strongoineH (2)

- (4) 1:5
- 4. How do Natural Killer Cells recognize and kill the abnormal cells ? Eilerendet (1)
 - (1) By presence of MHC class I
 - (2) By absence of MHC class I

(3) By presence of MHC class II (4) By absence of MHC class II

- Which of these is *not* a property of stem cells ? 5.
 - (1) Self renewal
 - (2) Differentiation
 - (3) Immortality
 - (4) Pluripotency

PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(C) P. T. O.

- 2
- 6. Which of the following cells lack the ability to divide ?
 - (1) red blood cells
 - (2) muscle cells
 - (3) nerve cells
 - (4) All of the above

7. Loops in lampbrush chromosomes represent site of :

C

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(2) Lymph neul (S)

(I) Linkage equilitient

12) Genothe-wide association

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(1) By prosecuce of MHC class 1

(2) By addence of MIHE class I

(3) By preserve of MINC view II

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(3) Stillesensing

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(3) 2 - 1

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- (1) Replication
- (2) Transcription
- (3) Cell division
- (4) Crossing over
- 8. How can it be determined whether the parent progeny is homozygous or heterozygous ?
 - (1) Test cross
 - (2) Back cross
 - (3) Monohybrid cross
 - (4) Reciprocal cross
- 9. The expression of Holandric genes causes the following genetic trait :
 - (1) Haemophilia
 - (2) Huntington's disease

(3) Down's syndrome

(4) Hypertrichosis

10. The DNA binding proteins bind at the :

(1) Minor groove

(2) Major groove

(3) Phosphate molecules

(4) Pentose sugars

PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(C)

11.

С

- To which class of transcription factor do nuclear receptors belong ? (1) Helix-loop-helix proteins
 - (2) Leucine zipper proteins
 - (3) Helix-turn-helix proteins
 - (4) Zinc finger proteins
- Which of the following chromosomal aberration shows pseudodominance ? 12. antiberracht parg (1) antiber (1) Deletion

(1) 60-95m long

(2) 30-40pt long

anol m06-01 (7)

salson (T)

(1) Peckmase

(2) Erydurawacia

(4) Gilleruss is manuarante

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(4) 120-150m long

(1) manners were setting of the sett

(4) (4) and (2) archorate (4) (4)

- (2) Duplication
- (3) Inversions
- (4) Translocation
- 13. What are protamines ? allycosylation sites into the property (1) Large size DNA
 - (2) Sequences that are unique
 - (3) Histone like protein found in fish sperm
 - (4) Highly repetitive DNA
- Which of the following about mRNA stability is correct ? h mist chief M 14. (1) Regulation of mRNA stability is a way of regulating gene expression (2) Prokaryotic mRNAs have a half-life of only a few minutes

 - (3) poly-A tails stabilize eukaryotic mRNAs (F) Distary grootypics (4) All of the above (4) Metallological & and the set of the set
- When 18 out of 20 amino acids have more than one codon to specify them, and 15. these codon referred as :

(1) Parallowing is a discours is the second in the second in the

(1) Beeneralistic includes and the states of the

- (1) universal codons
- (2) synonymous codons
- (3) overlapping codons
- (4) (1) and (2) are correct

PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(C) P. T. O.

- 16. The linear sequence (primary structure) of tRNAs is :(1) 60-95nt long
 - (2) 30-40nt long

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- (3) 10-30nt long
- (4) 120-150nt long

(2) Loncore zupper revenus
(3) Relevictor function promins
(3) Relevictor function promins

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12.

achalad (1)

(2) Duplication

(1) Invensions

none clean if (4)

(1) Serie roes that are printed

AMO sublement visionity (4)

(1) Historic use protein found in fish sperm

(2) Pressions one mRMAs have a ball-life of only

(1) say A will visitive enhanced and the

17. There are many modified nucleosides present in tRNA structure, such as :

(1) pseudouridine

(2) inosine

(3) adenosine

(4) (1) and (2) are correct

18. Which enzyme has significantly increased clinical activity after engineering more glycosylation sites into the protein ?
 (1) Destinates

(1) Pectinase

- (2) Erythropoietin
- (3) Calmodulin
- (4) Glucose isomerase
- **19.** Which term describes the field of nutrigenomics that focuses on identifying how individual genetic variations influence dietary responses and health outcomes ?
 - (1) Nutritional epidemiology
 - (2) Personalized nutrition
 - (3) Dietary genotyping
 - (4) Metabolomics
- 20. Which genera of microorganisms have the most diverse pathways for bioremediation ?
 (1) Pseudomonas
 (2) Rhodococcus
 (3) Escherechia
 - (4) Methylobium

1997 TUD STE (2) Lou (1) (1)

PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(C)

21. Which of the following is *not* a potential application of transgenic animals in biomedicine ?

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KERTINE PER PREPARENT (1)

FLAMS monitorini AVA (F)

(4) Alueding mean abon of ininaderia

- (1) Production of recombinant proteins
- (2) Generation of animal models for human diseases
- (3) Enhancement of animal welfare
- (4) Xenotransplantation
- 22. What is the primary advantage of using transgenic animals over cell culture systems for the production of biopharmaceuticals ?
 - (1) Higher productivity (2) Lower production costs
 - (3) Easier purification methods (4) Reduced risk of contamination

23. Which organetic is responsible for deposification of hearing and anternoos in builder as

- 23. Which of the following statements about the Cre-lox system is *true*?
 (1) It is a site-specific recombination system derived from bacteria.
 (2) It is primarily used for gene knockout in transgenic animals.
 - (3) It involves the use of recombinases to remove DNA segments flanked by lox P sites.
 - (4) It is not suitable for generating tissue-specific gene expression in transgenic animals.
- 24. Which of the following factors is a significant challenge in the development of transgenic livestock ?
 - (1) Ethical concerns regarding animal welfare
- (2) Limited availability of suitable host organisms
 (3) Regulatory restrictions on transgenic animal research
 (4) Difficulty in achieving germline transmission of transgenes
- 25. What is the primary limitation of using transgenic animals for xenotransplantation ?
 (1) Risk of transmitting infectious diseases from animals to humans
 (2) Incompatibility between animal and human immune systems
 (3) Difficulty in obtaining sufficient numbers of transgenic animals
 (4) Lack of suitable organs for transplantation
 PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(C)
 P. T. O.

26. Which of the following techniques allows for the generation of inducible gene S ormalizarricald expression in transgenic animals?

and the Preduction of reconsistent and motors (1) Tet-off system

(2) Constitutive promoters

(3) RNA interference (RNAi) (3) Enhancement of annual wellow (4) Random integration of transgenes nonneurologienersonol/ (4)

27. What is the function of the nucleolus in eukaryotic cells ?

31. What is the primary chall therapeutic genes in gene th (1) Immune response (2) Vector integration (3) Transient transgene exp

C

С

(4) Promoter activity

32. What is the primary objecti

(1) Protein synthesis (2) DNA replication (4) Lipid synthesis (3) Ribosome assembly

uccheminances in Alle bacabasi (1)

28. Which organelle is responsible for detoxification of harmful substances in eukaryotic cells? Y meet a manya colord about a and the Creetox system a least Y

aboritori nomentran mechads

- (1) Golgi apparatus (2) Peroxisomes and an anne and anne sond anne al base given in a de Sa
- (3) Lysosomes (4) Endoplasmic reticulum
- 29. What is the primary purpose of comparative genomics ? (1) To study the structure and function of genomes across different species (2) To analyze gene expression patterns in response to environmental stimuli (3) To identify single nucleotide polymorphisms (SNPs) within a population (4) To investigate protein-protein interactions in cellular networks

- (1) To induce apoptosis in (2) To stimulate immune r (3) To silence endogenous (4) To edit the genome of 1222R
 - 33. What is the purpose of gen (1) To predict gene expres (2) To annotate genes with (3) To identify protein-pro (4) To quantify gene expri a the first of the second first the second second
- 34. Which algorithm is commo (1) Clustal W (2) Smith-Waterman
- (an planted in achieve combine unamission of musicants) Which of the following techniques is used to identify proteins in a complex mixture 30. based on peptide sequences ?
 - (1) Enzyme-linked immunosorbent assay (ELISA)

6

(2) Polymerase chain reaction (PCR) (3) Liquid chromatography-mass spectrometry (LC-MS) (4) Microarray analysis

(d) Lack of sumble on sustain one interior to lice (b) PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(C)

(3) Viterbi (4) PageRank

Which of the following is 35. (1) Smith-Waterman algo (2) Needleman-Wunsch (3) BLAST algorithm (4) K-means clustering a

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31. What is the primary challenge associated with achieving long-term expression of Samerican she with ust among therapeutic genes in gene therapy ?

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(L, BP995

(185776 (E)

(1) ALS.

PON (M)

DIM (L)

Paintant transpont plants?

ablair and Longeral (15)

(2) Receipted environmental impact

noiseling as a second a secondard (1)

(2) Shuadhe and medican theathered (5)

in Agrobal terror and the second terror and the second the second terror is the second terror and t

and an Macroson and DOMA in an and a particular in

(1) Immune response

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- (2) Vector integration
- (3) Transient transgene expression
- (4) Promoter activity

- What is the primary objective of suicide gene therapy? 32. (1) To induce apoptosis in target cells
 - (2) To stimulate immune responses against tumor cells
 - (3) To silence endogenous genes
- (4) To edit the genome of target cells
 - What is the purpose of gene ontology (GO) in bioinformatics ? 33.
 - (1) To predict gene expression patterns
 - (2) To annotate genes with functional information
 - (3) To identify protein-protein interactions
 - (4) To quantify gene expression levels 33. What is the primary challenge in graating transmission aminals commared in plants?
 - Which algorithm is commonly used for multiple sequence alignment in bioinformatics ? 34. (1) Clustal W
 - (2) Smith-Waterman
 - (3) Viterbi
 - (4) PageRank

40. Which of the fullowing techniques is commonly used for the medication of transport

- Which of the following is not a commonly used sequence alignment algorithm ? 35.
 - (1) Smith-Waterman algorithm
 - (2) Needleman-Wunsch algorithm
 - (3) BLAST algorithm
 - (4) K-means clustering algorithm



36. Which of the following is a commonly used gene in the development of transgenic yourself yours in going only ? plants for herbicide resistance ?

(1) EPSPS

8

(2) ACCase

(3) ALS

(4) NOS

Electrochemical bioser 41. electroactive species at an analyte within a sar (1) Amperometric (2) Dielectric (3) Immuno

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milengolar maler / let

When a monor activity.

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atom ((f)

actrible Watting (S)

11) Seinh-Waterman algorith

in BLAST Hawrith

12) Needlonsan Wansen algorithus

(4) K-means chuster ug algorith

noissent transient (ranseine expression

ANTENCE endorerous genes

all. To predict gane expression paucins

and Tradentify molenn protein mergerions

(4) Matrix

- 37. The ligase enzyme from bacteriophage T4 uses : (1) $CaCl^2$ (2) ATPA DERONODA SOUDDING (2) (3) Mn^{2+} alles some knin (4) NAD or show steller in all (1)
- 38. Which of the following is a potential benefit of genetically modified (GM) insectresistant transgenic plants ?
 - (1) Increased use of chemical pesticides
 - (2) Reduced environmental impact
 - (3) Enhanced biodiversity non-activity handbrack drives and pissones of (5)
 - (4) Decreased crop yields
- the quantity actue expression levels **39.** What is the primary challenge in generating transgenic animals compared to plants ? (1) Inefficient gene transfer methods and to be a line of the second sec
- La destabilit stable signal will have 42. If screening is carried sequence, then the pro (1) in-silico (2) homologue search (3) annotation (4) partial search Sometimes the requir 43. the representation of (1) amplification
 - (3) selection

(2) Limited availability of selectable markers (3) Lack of suitable promoters for gene expression (4) Difficulty in culturing embryos in vitro

Which of the following techniques is commonly used for the production of transgenic 40. animals ? a company to be a common a common which solve the solve of t

(1) Embryonic stem cell manipulation

(2) Somatic cell nuclear transfer

(3) Agrobacterium-mediated transformation (4) Microinjection of DNA into oocytes

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44. For cloning purposes (1) agarose gel elect (2) fluorescence-act (3) polyacrylamide (4) chromatography

The process of exa 45. appropriate regions (1) microdissection (3) chromosome w

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Electrochemical biosensors that transduce the biological recognition events caused by 41. electroactive species at the sensing surface into a current signal for the quantification of an analyte within a sample matrix.

9

(2) Air-liff buoreactor

(1) Packed-bad biouracion

(4) Fluidized-best biomactor

concentration in a bioreactor d

(3) Optimies destants included (3)

(1) Turbucht) measurement

- (1) Amperometric
- (3) Househeeping genes are thuse gones which are mean in reps (TEC an (2) Dielectric in a species of organisin
 - (3) Immuno

(4) Matrix

- 47. Mulch the provint when when in manner of information in the large safe in the second of the seco 42. If screening is carried out on the basis of sequences which are related to the desired sequence, then the process is known as : (1) Stirred tank biorcactor
 - (1) in-silico
 - (2) homologue search
 - (3) annotation
 - (4) partial search 48. In bioprocess comparent, what is the primery marpose of a chomolifit?
 - Sometimes the required mRNA is present in less number. So the process of increasing 43. the representation of rare mRNAs is known as :
 - (2) normalization (1) amplification SCH STREET
 - (3) selection (4) narrowing

44. For cloning purposes, the intact chromosomes should be separated by :

- (1) agarose gel electrophoresis
- (2) fluorescence-activated sorter
- (3) polyacrylamide gel electrophoresis
- (4) chromatography
- The process of examining stained chromosomes in a light microscope and removing 45. appropriate regions with a micro-manipulator is called as :
 - (2) chromosome sorting (1) microdissection
 - (3) chromosome walking (4) chromosome jumping

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- 46. What do we mean by housekeeping genes?
- (1) Housekeeping genes are those genes which are specific to an organism
 - (2) Housekeeping genes are those genes which are present in all the organisms
 - (3) Housekeeping genes are those genes which are meant for repair and maintenance in a species of organism
 - (4) Housekeeping genes are those genes which required for the replication process

47. Which type of bioreactor configuration is typically used for large-scale industrial production of microbial products ? bariza

- (1) Stirred tank bioreactor
- (2) Air-lift bioreactor
- (3) Packed-bed bioreactor
- (4) Fluidized-bed bioreactor
- Prissing 18ther 141 In bioprocess engineering, what is the primary purpose of a chemostat ? 48. (1) To maintain a constant concentration of substrate (2) To maintain a constant volume of culture (3) To measure the growth rate of microorganisms nound Bomis (1)
 - (4) To control temperature and pH
- Which of the following is not a commonly used method for measuring biomass 49.

concentration in a bioreactor ?

Turbidity measurement (1)

(3) Optical density measurement

С

F

(1) agamise get electropheresis (2) Dry cell weight determination (4) Viscosity analysis

sequilibrian then the process is known as

outligent (1)

DOMMANNES (E)

finishing (5)

In marker-assisted breeding, what is the purpose of fine mapping? 50. (1) To identify quantitative trait loci (QTLs) associated with complex traits (2) To refine the physical location of a gene of interest within a chromosome region (3) To analyze the genetic diversity within a population (4) To assess the heritability of traits in different environments

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(2) Chercheration colargement) (2)

(3) DNA methylation

Teo and g Chip

(H) Valadard (H)

(2) Ennon (3)

(1), filmmiga sequencias

BELLEN MARTINE MERCHANNER (F.)

Which of the following is now a walker of the ASTON

(4) Pyrosequescing

XTZAJE (1)

51. Sickle cell anaemia is a genetic disorder. Which of the following doesn't holds true for it? (1) Chronnedn caster als in the second second and moderno noamon(1)

(1) It can be analysed by PCR

С

- (2) It destroys a restriction site
- (3) The mutation is in alpha globulin gene
- (4) The conventional approach took weeks for the whole analyses to be carried out
- Which of the following is may regioning the transferrence mininger of the strike of the set 52. Which is the most predominant type of leukocytes in the blood stream ? Ind the voil [1]]
- (2) Natural Killer Cells (1) Neutrophils (3) Macrophages (4) Monocytes such as signal inte
 - 53. Which thermodynamic principle states that the equilibrium constant (K) for a reaction (4) All the above is related to the standard free energy change (ΔG°)?
 - (1) The law of mass action
- 88. Which thermody months is a set of a second planet planet being bound doing with 188 biochernical reaction at constant enroperation and pressure
 - (3) The first law of thermodynamics
 - (4) The second law of thermodynamics
 - The genetic relatedness between organisms can be identified by studying the band 54. patterns when different PCR products are analyzed electrophoretically. This method is called as :

- (1) restriction fragment length polymorphism (RFLP)
 - (2) amplified fragment length polymorphism (AFLP)
 - (3) random amplification of polymorphic DNA (RAPD)
 - (4) polymorphism
 - PCR amplification can be used for which type of samples ? 55.
 - (1) Old samples only
 - (2) Recent samples only
 - (3) Equally to both recent and old samples
 - (4) Recent samples are preferred but can be applied to old samples also

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56. What is the primary consequence of histone acetylation on chromatin structure?

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maniquenteriou (1)

(1) Chromatin condensation

(2) Chromatin relaxation

(3) DNA methylation

(4) RNA splicing No hand of assessment of the look bench to the of the only senting to mine and start its

57. Which of the following is true regarding the transmembrane proteins? and hold do not setty with in serve inchemolyne with house it is the older. (1) They are drug targets or receptors

(2) They are responsible for performing a wide variety of important functions in a cell, such as signal transduction, cross-membrane transport, and energy conversion

is adapted in the landard free energy thange 130%

(3) Constitute up to 30% of all cellular proteins

(4) All the above

- BORDE. ALMING WELLONT IT Which thermodynamic quantity represents the maximum useful work obtainable from a 58. biochemical reaction at constant temperature and pressure ? as many contracts to well will bott (1) (1) Enthalpy (H) enmany Lammari in wel houses off (4) (2) Entropy (S) (3) Helmholtz free energy (A) 11122M
- (4) Gibbs free energy (G) A LANC
 - R. Dalles Which sequencing technology is commonly used for metagenomic studies due to its 59. ability to generate long reads and detect novel microbial species ? (1) SOLiD sequencing (1975) a reliable longing to neuroinform motion (1)
- Wha 63. (1) B(2) Ba (3) Bas (4) Base

62.

(2

(3)

(4)

What is th 64. (1) They 1 (2) They re (3) They m (4) They me

(3) Nanopore sequencing (4) Pyrosequencing

Which of the following is not a variant of BLAST ? 60. Vian aslamise bio (1) (Ima coliganes freebald off) (1) BLASTX (2) TBLASTNX (3) BLASTP and a basis of (4) BLASTN and a first and the PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(C)udaaT-oid) A-1-1505-13-000

65. What do you I (1) Production (2) Production (3) Production of (4) Production of PHD-EE-2023-24/(Bio-T

13

Traduction Kauborf (1)

(2) Product mainfication

minufamol sibaM (0)

hotalid (4)

(3) Landell sites

(4) Press water.

EnmoH (1)

(2) Navigation

anthron-sH (C)

unhtoW (M)

- (1) Determine the thickness of the mobile phase
- (2) Determine the thickness of the stationary phase
- (3) Estimate the efficiency of the column

С

- (4) Measure the distribution of the analyte between mobile and stationary phases
- 62. Which of the following condition is of reverse phase chromatography ?
 - (1) The mobile phase is non-polar and stationary phase is polar
 - (2) The mobile phase is polar and stationary phase is non-polar
 - (3) Both the mobile phase and stationary phase are organic
 - (4) Both the mobile phase and stationary phase are inorganic
- 63. What is rate-zonal centrifugation ?
 (1) Based on separation of particles by mass
 (2) Based on separation of particles by density
 (3) Based on separation of particles on solubility
 (4) Based on separation of particles on size
- 64. What is the role of Argonaute proteins in RNA interference pathways ?
 - (1) They facilitate the processing of precursor miRNAs into mature miRNAs.
 - (2) They recognize and bind to specific siRNAs or miRNAs.
 - (3) They methylate DNA at specific CpG sites.
 - (4) They mediate histone acetylation and deacetylation.
- 65. What do you mean by "Trophophase" ?
 - (1) Production of waste materials
 - (2) Production of topical products
 - (3) Production of primary metabolites
 - (4) Production of secondary metabolites

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- 66. Which of the following is an upstream process?
 - sening Malor of the second oids only the malor (1) (1) Product recovery
 - (1) Determine the this phile complete the philes philes (2) Product purification

in Estimate the efficiency of the column

C

- (3) Media formulation
- (4) Cell lysis a bus sledon about of stylens all he contribute but one of the set (4)
- 67. In fed-batch culture, the feed solution is :
 - (1) Less concentrated
 - (2) Highly concentrated

(a) Both the mobile place and stanomic place methods (b)

Dad billiona in AVCI stellerson yodT (E)

all Production of w sale modules

the Prediction of toppical moderat

Providential of the providence of the moleculation of the second se

(4) Production of secondary as which an

- (3) Highly diluted
- (4) Diluted
- Which one of the following is not included in the mechanism of bioleaching ? **68.** (1) Acidolysis assent vid solditus fto mineragos we how he list (2) Complexolysis (2) Based on repairs of particies by density (3) Redoxolysis whide he sold in of a sold in a sold of hard like in sold himy (4) Hydrolysis (4) Based on separation of pairicles on size
- 69. Which of the following has less organic matter load ?

 - (1) Marshlands (2) Marine sediments Motoman a Middle alliques ca mid base extremises y sells (1)
 - (3) Landfill sites
 - (4) Fresh water
- (1) They mediate maleur accusacion and dencetylarion. The inherent ability of an animal to navigate towards an original location through 70.
 - (1) Homing
 - (2) Navigation
 - (3) Re-routing
 - (4) Walking



- What is the correct order for increasing gene density ? 71.
 - (1) Bacteria, Virus, Fruit fly, Human
 - (2) Fruit fly, Bacteria, Virus, Human
 - (3) Human, Fruit fly, Bacteria, Virus
- (2) Brannar inducing, room inducing

(1) row inducing, turnoin inducing

(1) Reports inducing, show inducing (4) Virus, Bacteria, Fruit fly, Human

(1) Cham termination sequencing

(J) Real time floorescence sequencing

(2) Radio labeled sequencing

The search of th

- 72. What do you think is the requirement of Intergenic DNA in higher organisms?
 - (1) Just genetic load

С

- (2) To avoid viable mutations
- (3) Helps in regulation of transcription
- (4) Helps in genome organization

West Husseller House for statisticate and the

- Which factor can affect the accuracy of metagenomic analysis ? 73.
 - (1) Sample size (1) RecBAD padiway
 - (2) DNA extraction method
 - (3) Bioinformatics software
 - (4) All of the above

(3) RecAHD pathway

(2) RedBCD pathway

- (4) RecDCB pathway Wellede on den for naving genranke differentions is associated with consy therefore which makes
- What is the purpose of rarefaction analysis in metagenomics ? 74. (1) To estimate the total number of species in a sample (2) To normalize sequencing data for differences in sample size (3) To identify microbial taxa with low abundance
 - (4) To quantify the functional diversity of microbial communities
- 75. If a gene is inactivated by gene targeting then it is called as :
 - (1) knock-in gene
 - (2) knock-out gene
 - (3) gene disruption
 - (4) insertional inactivation

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76. Agrobacterium tumefaciens and Agrobacterium rhizogenes form : nernall yft nerel arniV street all (1)

nermult and V marriell straight it.

and smalosell wit there? persist if i

bard wereng well in

(1) Sample war

another a stary bieve of (1)

(2) DMA oxisteration method.

(3) BRUME COMMENTS STREETS AND

the other other in 11/2. (2)

(3) Heips in regulation of gaascription

14) Helps in promotion or another its

- (1) root inducing, tumour inducing
- (2) tumour inducing, root inducing
- (3) tumour inducing, shoot inducing
- asoust, verment annal avoir it. (4) non-tumour inducing, shoot inducing
- Automated sequencing is defined as : 77.
 - (1) Chain termination sequencing
 - (2) Radio labeled sequencing
 - (3) Real time fluorescence sequencing
 - (4) Pyrosequencing
- What is the other name of DSB repair pathway? 78.
 - (1) RecBAD pathway
 - (2) RecBCD pathway
 - (3) RecABD pathway
 - (4) RecDCB pathway
- What is the holiday junction ? 79.
 - (1) The site of strand break
 - (2) The site of heteroduplex DNA formation
 - (3) Formation of a crossing over complex
 - (4) The site of strand invasion
- The most commonly observed modification in the histone includes : 80. March 6 11 1 BY (1) Acetylation of arginine and phosphorylation of threonine (2) Acetylation of lysine and phosphorylation of threonine (3) Acetylation of lysine and phosphorylation of serine (4) Acetylation of arginine and phosphorylation of serine

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81. Which of the following is not a type of enzyme inhibition? 188 reading related to biotechnological myranians? (1) Competitive inhibition (I) Word Realin Organization (WHO) (2) Allosteric inhibition (C) World Trade Organization (WTO) (3) Irreversible inhibition (OAR) root and Agriculture Organization (FAO) **Cooperative** inhibition (4) (4, World Intellectual Property Organization (M IPO) Which of the following terms describes the maximum rate of an enzyme-catalyzed 82.

reaction under saturating substrate concentrations ?

(1) Turnover number

(3) Kcat

(2) Michaelis constant (4) Allosteric constant

ALL PROMOTION 25 DUILO What is the primary advantage of next-generation sequencing (NGS) technologies over 83. traditional Sanger sequencing?

a state with the property with the state of the state of

(1) Higher accuracy

- (2) Lower cost per base pair
- (3) Longer read lengths
- (4) Greater throughput

(2) Food and Drug Administration (FDA)

(i) Manonal Inscience of Health (FHL)

these suffering an an engine shall

AV.11 (1)

(1) anona (F)

17

(1) World Health Organization (WIII) Which of the fol owing genomic alterations is associated with copy number variation 84. (CNV)?

(1) Single nucleotide polymorphisms (SNPs)

- 83. What is the role of history and be only forming the start in the share of the start of the (2) Insertions and deletions (indels) (1) To oversee the enforcement of intellectual
 - (3) Amplifications and deletions of large genomic regions
 - (4) Translocations between chromosomes
- Which technique is commonly used to study protein-protein interactions in a high-85. throughput manner? (1) Yeast two-hybrid (Y2H) system

 - (2) Immunoprecipitation (IP)
 - (3) Chromatin immunoprecipitation (ChIP)
 - (4) RNA interference (RNAi)

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Which international organization oversees the enforcement of intellectual property 86. noundinfai or nitromo) . Li rights related to biotechnological inventions ? antidida interation A (2) (1) World Health Organization (WHO) (3) Inevenible multinion (2) World Trade Organization (WTO) (3) Food and Agriculture Organization (FAO) mindrala avasisation (Li (4) World Intellectual Property Organization (WIPO)

What is DNA coated 91. (1) Silver (2) Aluminium (3) Gold (4) Calcium

С

1832 (6)

((VV))

(it) Lancer read longth

14. Creater throughten

Which of the tottewing terms describes the maximum rate of an engrated of the data of

87. Which of the following accumulates from factory waste?

(i) Tomover mumber (1) Pseudomonas aeruginosa (2) Thiobacillus (3) Pseudomonas putida

(4) Zoogloea ramigera 33970 ASUL ballitional Sameer sequencing?

Which organization is responsible for establishing guidelines and regulations for the 88. ethical conduct of biomedical research involving human subjects ? TSVAL IS

(1) National Institutes of Health (NIH)

(2) Food and Drug Administration (FDA)

(3) World Health Organization (WHO)

(4) UNESCO International Bioethics Committee

92. Which of these are r (1) Leucine and ser (2) Lysine and glut (3) Tryptophan and (4) Leucine and lys Which one of the fo 93. (1) Left-handed DN (2) Mostly found in (3) Only one deep, (4) All of the above

- What is the role of Institutional Biosafety Committees (IBCs) in research institutions ? 89. (1) To oversee the enforcement of intellectual property rights (2) To regulate the ethical conduct of biomedical research (3) To ensure compliance with biosafety regulations and guidelines (4) To promote public awareness of biotechnological innovations
- RNA domain that binds a ligand, causing a change in secondary structure of the RNA, 90.

(1) tRNA

(3) microRNA

(2) Aptamer (4) Antisense RNA (COMBINED AND STREET OF CRIMENT)

Which of the follow 94. (1) N-acetylmuram (2) Sialic acid (3) Aminoglycosid (4) All of the above Which class of cart 95. (1) Monosaccharid (2) Oisaccharides (3) Polysaccharide (4) Oligosaccharid





91. What is DNA coated onto when transforming plant cells with a particle gun ?
(1) Silver
(2) Aluminium
(3) Gold
(4) Calcium

92. Which of these are rare amino acid in a protein ?

- (1) Leucine and serine
 (2) Lysine and glutamic acid
 (3) Tryptophan and methionine
 (4) Leucine and lysine
- 93. Which one of the following statement is correct for Z-DNA ?(1) Left-handed DNA
 - (2) Mostly found in alternating purine-pyrimidine sequences
 - (3) Only one deep, narrow groove
 - (4) All of the above

C

- 94. Which of the following amino sugar are present in the bacterial cell wall ?(1) N-acetylmuramic acid
 - (2) Sialic acid
 (3) Aminoglycoside
 (4) All of the above
- (2) Zygonaonas mobilis
 (3) Sacchammyces usaum
 (4) All of the chore's

synally sale to U.A. (24)

(2) Sugarasterad

(4) Campeatend

Instantia (1)

- 95. Which class of carbohydrates is considered as non-sugar ?
 - (1) Monosaccharides men alles meter edgid allesses me ableis phoiding (1)
 - (2) Oisaccharides
 - (3) Polysaccharides de roit, lles and a tedade plinter and the start distriction of the secondary it is
 - (4) Oligosaccharides

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Name the two essential fatty acids ? 96.

- (1) Linoleate and linolenate
- (2) Oleic and linoleic
- (3) Lauric and myristic
- (4) Arachidonic and oleic
- What is the primary advantage of using plant cell culture in industrial biotechnology ? 97. (1) Leacine and series (1) Rapid growth rates
 - (2) Ability to produce complex molecules

Dim pomelule line anies I ("I)

(I) Treprophing and methology T (E)

Daily one desits nament groups

(4) Lene and rysine

AZO Istonet D.I.

С

112 8112 (1)

LIDD (FY

MINICO ILI

munumale il)

- (3) Low production costs
- (4) Ease of genetic manipulation.
- 98. Which of the following sterol is present in the cell membrane of fungi?
 - (1) Ergosterol
 - (2) Stigmasterol
 - (3) Sitosterol
 - (4) Campesterol

14) Ali II the showe

1. The weter? U.S.L.

Di Aminelly coside

Sycalic sill he life the

(4) Obernsteinsteiner

hior purrant robe W (1)

- Which of the following microorganisms help in the ethanol production ? 99.
 - (1) Saccharomyces cerevisiae
 - (2) Zygomonas mobilis
 - (3) Saccharomyces uvarum
 - (4) All of the above
- Antibiotics are typically produced in fed batch reactors because : 100.
 - (1) antibiotic yields are generally higher when cells enter the stationary phase (2) the precursors are often toxic to the cells and rush suggits of
 - (3) antibiotic yields are generally higher when cell growth slows
 - (4) All of the above

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Bio-Technology Engineering

Sr. No.

Total No. of Printed Pages : 21

Time : 1¼ Hours Roll No. (in figures)	Max. Marks : 100 (in words)	Total Questions : 100
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Date of Examination		

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(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

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- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfairmeans / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
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- 5. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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- 1. Which of the following is not a type of enzyme inhibition ?
 - (1) Competitive inhibition
 - (2) Allosteric inhibition
 - (3) Irreversible inhibition
 - (4) Cooperative inhibition
- 2. Which of the following terms describes the maximum rate of an enzyme-catalyzed reaction under saturating substrate concentrations ?
 - (1) Turnover number (2) Michaelis constant
 - (3) Kcat (4) Allosteric constant
- 3. What is the primary advantage of next-generation sequencing (NGS) technologies over traditional Sanger sequencing ?
 - (1) Higher accuracy
 - (2) Lower cost per base pair
 - (3) Longer read lengths
 - (4) Greater throughput
- 4. Which of the following genomic alterations is associated with copy number variation (CNV)?
 - (1) Single nucleotide polymorphisms (SNPs)
 - (2) Insertions and deletions (indels)
 - (3) Amplifications and deletions of large genomic regions
 - (4) Translocations between chromosomes
- 5. Which technique is commonly used to study protein-protein interactions in a high-throughput manner?
 - (1) Yeast two-hybrid (Y2H) system
 - (2) Immunoprecipitation (IP)
 - (3) Chromatin immunoprecipitation (ChIP)
 - (4) RNA interference (RNAi)

P. T. O.

- 6. Which international organization oversees the enforcement of intellectual property rights related to biotechnological inventions ?
 - (1) World Health Organization (WHO)
 - (2) World Trade Organization (WTO)
 - (3) Food and Agriculture Organization (FAO)
 - (4) World Intellectual Property Organization (WIPO)
- 7. Which of the following accumulates from factory waste?
 - (1) Pseudomonas aeruginosa
 - (2) Thiobacillus
 - (3) Pseudomonas putida
 - (4) Zoogloea ramigera
- 8. Which organization is responsible for establishing guidelines and regulations for the ethical conduct of biomedical research involving human subjects ?
 - (1) National Institutes of Health (NIH)
 - (2) Food and Drug Administration (FDA)
 - (3) World Health Organization (WHO)
 - (4) UNESCO International Bioethics Committee
- 9. What is the role of Institutional Biosafety Committees (lBCs) in research institutions ?
 - (1) To oversee the enforcement of intellectual property rights
 - (2) To regulate the ethical conduct of biomedical research
 - (3) To ensure compliance with biosafety regulations and guidelines
 - (4) To promote public awareness of biotechnological innovations
- 10. RNA domain that binds a ligand, causing a change in secondary structure of the RNA, thus affecting gene expression.
 - (1) tRNA
 (2) Aptamer
 (3) microRNA
 (4) Antisense RNA

- 11. Sickle cell anaemia is a genetic disorder. Which of the following doesn't holds true for it?
 - (1) It can be analysed by PCR
 - (2) It destroys a restriction site
 - (3) The mutation is in alpha globulin gene
 - (4) The conventional approach took weeks for the whole analyses to be carried out
- 12. Which is the most predominant type of leukocytes in the blood stream ?
 - (1) Neutrophils (2) Natural Killer Cells
 - (3) Macrophages (4) Monocytes
- **13.** Which thermodynamic principle states that the equilibrium constant (K) for a reaction is related to the standard free energy change (ΔG°) ?
 - (1) The law of mass action
 - (2) Hess's law
 - (3) The first law of thermodynamics
 - (4) The second law of thermodynamics
- 14. The genetic relatedness between organisms can be identified by studying the band patterns when different PCR products are analyzed electrophoretically. This method is called as :
 - (1) restriction fragment length polymorphism (RFLP)
 - (2) amplified fragment length polymorphism (AFLP)
 - (3) random amplification of polymorphic DNA (RAPD)
 - (4) polymorphism
- 15. PCR amplification can be used for which type of samples ?
 - (1) Old samples only
 - (2) Recent samples only
 - (3) Equally to both recent and old samples
 - (4) Recent samples are preferred but can be applied to old samples also

P. T. O.

- 16. What is the primary consequence of histone acetylation on chromatin structure ?
 - (1) Chromatin condensation
 - (2) Chromatin relaxation
 - (3) DNA methylation
 - (4) RNA splicing
- 17. Which of the following is true regarding the transmembrane proteins?
 - (1) They are drug targets or receptors
 - (2) They are responsible for performing a wide variety of important functions in a cell, such as signal transduction, cross-membrane transport, and energy conversion
 - (3) Constitute up to 30% of all cellular proteins
 - (4) All the above
- **18.** Which thermodynamic quantity represents the maximum useful work obtainable from a biochemical reaction at constant temperature and pressure ?
 - (1) Enthalpy (H)
 - (2) Entropy (S)
 - (3) Helmholtz free energy (A)
 - (4) Gibbs free energy (G)
- **19.** Which sequencing technology is commonly used for metagenomic studies due to its ability to generate long reads and detect novel microbial species ?
 - (1) SOLiD sequencing
 - (2) Illumina sequencing
 - (3) Nanopore sequencing
 - (4) Pyrosequencing

20. Which of the following is *not* a variant of BLAST ?

(1)	BLASTX	(2)	TBLASTNX
(3)	BLASTP	(4)	BLASTN

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- 21. What is the primary challenge associated with achieving long-term expression of therapeutic genes in gene therapy ?
 - (1) Immune response
 - (2) Vector integration
 - (3) Transient transgene expression
 - (4) Promoter activity
- 22. What is the primary objective of suicide gene therapy?
 - (1) To induce apoptosis in target cells
 - (2) To stimulate immune responses against tumor cells
 - (3) To silence endogenous genes
 - (4) To edit the genome of target cells
- 23. What is the purpose of gene ontology (GO) in bioinformatics ?
 - (1) To predict gene expression patterns
 - (2) To annotate genes with functional information
 - (3) To identify protein-protein interactions
 - (4) To quantify gene expression levels
- 24. Which algorithm is commonly used for multiple sequence alignment in bioinformatics ?
 - (1) Clustal W
 - (2) Smith-Waterman
 - (3) Viterbi
 - (4) PageRank
- 25. Which of the following is *not* a commonly used sequence alignment algorithm ?
 - (1) Smith-Waterman algorithm
 - (2) Needleman-Wunsch algorithm
 - (3) BLAST algorithm
 - (4) K-means clustering algorithm

- 26. Which of the following is a commonly used gene in the development of transgenic plants for herbicide resistance?
 - (1) EPSPS
 - (2) ACCase
 - (3) ALS
 - (4) NOS

27. The ligase enzyme from bacteriophage T4 uses :

(1)	CaCl	(2)	ATP
(3)	Mn ²⁴	(4)	NAD^{*}

- 28. Which of the following is a potential benefit of genetically modified (GM) insectresistant transgenic plants ?
 - Increased use of chemical pesticides
 - (2) Reduced environmental impact
 - (3) Enhanced biodiversity
 - (4) Decreased crop yields
- 28. What is the primary challenge in generating transgenic animals compared to plants ?
 - (1) Inefficient gene transfer methods
 - (2) Limited availability of selectable markers
 - (3) Lack of suitable promoters for gene expression
 - (4) Difficulty in culturing embryos in vitro
- **30.** Which of the following techniques is commonly used for the production of transgenic animals ?
 - (1) Embryonic stem cell manipulation
 - (2) Somatic cell nuclear transfer
 - (3) Agrobacterium-mediated transformation
 - (4) Microinjection of DNA into oocytes

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- 31. What is the site of activation and differentiation of B-cells?
 - (1) Bone marrow
 - (2) Lymph nodes
 - (3) Spleen
 - (4) Thymus
- **32.** Which term describes the phenomenon where a molecular marker is physically close to the gene controlling the trait of interest ?
 - (1) Linkage equilibrium
 - (2) Genome-wide association
 - (3) Linkage disequilibrium
 - (4) Marker-trait association

33. What is the ratio of $CD4^+$ cells to $CD8^+$ cells ?

- (1) 1:2
- (2) 2:5
- (3) 2:1
- (4) 1:5
- **34.** How do Natural Killer Cells recognize and kill the abnormal cells ?
 - (1) By presence of MHC class I
 - (2) By absence of MHC class I
 - (3) By presence of MHC class II
 - (4) By absence of MHC class II
- 35. Which of these is not a property of stem cells ?
 - (1) Self renewal
 - (2) Differentiation
 - (3) Immortality
 - (4) Pluripotency

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- (1) red blood cells
- (2) muscle cells
- (3) nerve cells
- (4) All of the above

- **37.** Loops in lampbrush chromosomes represent site of :
 - (1) Replication
 - (2) Transcription
 - (3) Cell division
 - (4) Crossing over

38. How can it be determined whether the parent progeny is homozygous or heterozygous?

- (1) Test cross
- (2) Back cross
- (3) Monohybrid cross
- (4) Reciprocal cross

The expression of Holandric genes causes the following genetic trait : 39.

- (1) Haemophilia
- (2) Huntington's disease
- (3) Down's syndrome
- (4) Hypertrichosis
- The DNA binding proteins bind at the : 40.
 - (1) Minor groove
 - (2) Major groove
 - (3) Phosphate molecules
 - (4) Pentose sugars

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- 41. What is DNA coated onto when transforming plant cells with a particle gun ?
 - (1) Silver
 - (2) Aluminium
 - (3) Gold
 - (4) Calcium
- 42. Which of these are rare amino acid in a protein ?
 - (1) Leucine and serine
 - (2) Lysine and glutamic acid
 - (3) Tryptophan and methionine
 - (4) Leucine and lysine
- 43. Which one of the following statement is correct for Z-DNA?
 - (1) Left-handed DNA
 - (2) Mostly found in alternating purine-pyrimidine sequences
 - (3) Only one deep, narrow groove
 - (4) All of the above
- 44. Which of the following amino sugar are present in the bacterial cell wall?
 - (1) N-acetylmuramic acid
 - (2) Sialic acid
 - (3) Aminoglycoside
 - (4) All of the above
- 45. Which class of carbohydrates is considered as non-sugar ?
 - (1) Monosaccharides
 - (2) Oisaccharides
 - (3) Polysaccharides
 - (4) Oligosaccharides

- (1) Linoleate and linolenate
- (2) Oleic and linoleic
- (3) Lauric and myristic
- (4) Arachidonic and oleic

47. What is the primary advantage of using plant cell culture in industrial biotechnology ?

- (1) Rapid growth rates
- (2) Ability to produce complex molecules
- (3) Low production costs
- (4) Ease of genetic manipulation.

48. Which of the following sterol is present in the cell membrane of fungi?

- (1) Ergosterol
- (2) Stigmasterol
- (3) Sitosterol
- (4) Campesterol

49. Which of the following microorganisms help in the ethanol production ?

- (1) Saccharomyces cerevisiae
- (2) Zygomonas mobilis
- (3) Saccharomyces uvarum
- (4) All of the above
- 50. Antibiotics are typically produced in fed batch reactors because :
 - (1) antibiotic yields are generally higher when cells enter the stationary phase
 - (2) the precursors are often toxic to the cells
 - (3) antibiotic yields are generally higher when cell growth slows
 - (4) All of the above

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- 51. Which of the following is *not* a potential application of transgenic animals in biomedicine?
 - (1) Production of recombinant proteins
 - (2) Generation of animal models for human diseases
 - (3) Enhancement of animal welfare
 - (4) Xenotransplantation
- 52. What is the primary advantage of using transgenic animals over cell culture systems for the production of biopharmaceuticals ?
 - (1) Higher productivity (2) Lower production costs
 - (3) Easier purification methods (4) Reduced risk of contamination
- 53. Which of the following statements about the Cre-lox system is true ?
 - (1) It is a site-specific recombination system derived from bacteria.
 - (2) It is primarily used for gene knockout in transgenic animals.
 - (3) It involves the use of recombinases to remove DNA segments flanked by lox P sites.
 - (4) It is not suitable for generating tissue-specific gene expression in transgenic animals.
- 54. Which of the following factors is a significant challenge in the development of transgenic livestock ?
 - (1) Ethical concerns regarding animal welfare
 - (2) Limited availability of suitable host organisms
 - (3) Regulatory restrictions on transgenic animal research
 - (4) Difficulty in achieving germline transmission of transgenes
- 55. What is the primary limitation of using transgenic animals for xenotransplantation ?
 - (1) Risk of transmitting infectious diseases from animals to humans
 - (2) Incompatibility between animal and human immune systems
 - (3) Difficulty in obtaining sufficient numbers of transgenic animals
 - (4) Lack of suitable organs for transplantation

- Which of the following techniques allows for the generation of inducible geneexpression in transgenic animals ? 56.
 - (1) Tet-off system
 - (2) Constitutive promoters
 - (3) RNA interference (RNAi)
 - (4) Random integration of transgenes

- What is the function of the nucleolus in eukaryotic cells ? (2) DNA replication 57.
 - (1) Protein synthesis (4) Lipid synthesis
 - (3) Ribosome assembly

Which organelle is responsible for detoxification of harmful substances in eukaryotic 58. cells?

- (1) Golgi apparatus
- (2) Peroxisomes
- (3) Lysosomes
- (4) Endoplasmic reticulum

What is the primary purpose of comparative genomics ? 59.

- (1) To study the structure and function of genomes across different species
- (2) To analyze gene expression patterns in response to environmental stimuli
- (3) To identify single nucleotide polymorphisms (SNPs) within a population
- (4) To investigate protein-protein interactions in cellular networks
- Which of the following techniques is used to identify proteins in a complex mixture 60. based on peptide sequences ?
 - (1) Enzyme-linked immunosorbent assay (ELISA)
 - (2) Polymerase chain reaction (PCR)
 - (3) Liquid chromatography-mass spectrometry (LC-MS)
 - (4) Microarray analysis

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- 61. What is the correct order for increasing gene density ?
 - (1) Bacteria, Virus, Fruit fly, Human
 - (2) Fruit fly, Bacteria, Virus, Human
 - (3) Human, Fruit fly, Bacteria, Virus
 - (4) Virus, Bacteria, Fruit fly, Human

62. What do you think is the requirement of Intergenic DNA in higher organisms ?

- (1) Just genetic load
- (2) To avoid viable mutations
- (3) Helps in regulation of transcription
- (4) Helps in genome organization
- 63. Which factor can affect the accuracy of metagenomic analysis ?
 - (1) Sample size
 - (2) DNA extraction method
 - (3) Bioinformatics software
 - (4) All of the above
- 64. What is the purpose of rarefaction analysis in metagenomics ?
 - (1) To estimate the total number of species in a sample
 - (2) To normalize sequencing data for differences in sample size
 - (3) To identify microbial taxa with low abundance
 - (4) To quantify the functional diversity of microbial communities
- 65. If a gene is inactivated by gene targeting then it is called as :
 - (1) knock-in gene
 - (2) knock-out gene
 - (3) gene disruption
 - (4) insertional inactivation

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- Agrobacterium tumefaciens and Agrobacterium rhizogenes form : (1) root inducing, tumour inducing
 - (2) tumour inducing, root inducing
 - (3) tumour inducing, shoot inducing
 - (4) non-tumour inducing, shoot inducing
- Automated sequencing is defined as : 67.
 - (1) Chain termination sequencing
 - (2) Radio labeled sequencing
 - (3) Real time fluorescence sequencing
 - (4) Pyrosequencing
- What is the other name of DSB repair pathway? 68.
 - (1) RecBAD pathway
 - (2) RecBCD pathway
 - (3) RecABD pathway
 - (4) RecDCB pathway
- What is the holiday junction ? 69.
 - (1) The site of strand break
 - (2) The site of heteroduplex DNA formation
 - (3) Formation of a crossing over complex
 - (4) The site of strand invasion
- The most commonly observed modification in the histone includes : 70.
 - (1) Acetylation of arginine and phosphorylation of threonine
 - (2) Acetylation of lysine and phosphorylation of threonine
 - (3) Acetylation of lysine and phosphorylation of serine
 - (4) Acetylation of arginine and phosphorylation of serine

66.

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 - 71. To which class of transcription factor do nuclear receptors belong ?
 - (1) Helix-loop-helix proteins
 - (2) Leucine zipper proteins
 - (3) Helix-turn-helix proteins
 - (4) Zinc finger proteins
 - 72. Which of the following chromosomal aberration shows pseudodominance?
 - (1) Deletion
 - (2) Duplication
 - (3) Inversions
 - (4) Translocation
 - 73. What are protamines ?
 - (1) Large size DNA
 - (2) Sequences that are unique
 - (3) Histone like protein found in fish sperm
 - (4) Highly repetitive DNA
 - 74. Which of the following about mRNA stability is correct ?
 - (1) Regulation of mRNA stability is a way of regulating gene expression
 - (2) Prokaryotic mRNAs have a half-life of only a few minutes
 - (3) poly-A tails stabilize eukaryotic mRNAs
 - (4) All of the above
 - **75.** When 18 out of 20 amino acids have more than one codon to specify them, and these codon referred as :
 - (1) universal codons
 - (2) synonymous codons
 - (3) overlapping codons
 - (4) (1) and (2) are correct
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76. The linear sequence (primary structure) of tRNAs is :

- (1) 60-95nt long
- (2) 30-40nt long
- (3) 10-30nt long
- (4) 120-150nt long

77. There are many modified nucleosides present in tRNA structure, such as :

- (1) pseudouridine
- (2) inosine
- (3) adenosine
- (4) (1) and (2) are correct
- **78.** Which enzyme has significantly increased clinical activity after engineering more glycosylation sites into the protein ?
 - (1) Pectinase
 - (2) Erythropoietin
 - (3) Calmodulin
 - (4) Glucose isomerase
- **79.** Which term describes the field of nutrigenomics that focuses on identifying how individual genetic variations influence dietary responses and health outcomes ?
 - (1) Nutritional epidemiology
 - (2) Personalized nutrition
 - (3) Dietary genotyping
 - (4) Metabolomics
- 80. Which genera of microorganisms have the most diverse pathways for bioremediation?
 - (1) Pseudomonas
 - (2) Rhodococcus
 - (3) Escherechia
 - (4) Methylobium

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- 81. Theoretical plates are used to :
 - (1) Determine the thickness of the mobile phase
 - (2) Determine the thickness of the stationary phase
 - (3) Estimate the efficiency of the column
 - (4) Measure the distribution of the analyte between mobile and stationary phases

82. Which of the following condition is of reverse phase chromatography ?

- (1) The mobile phase is non-polar and stationary phase is polar
- (2) The mobile phase is polar and stationary phase is non-polar
- (3) Both the mobile phase and stationary phase are organic
- (4) Both the mobile phase and stationary phase are inorganic

83. What is rate-zonal centrifugation ?

- (1) **Based on separation** of particles by mass
- (2) Based on separation of particles by density
- (3) Based on separation of particles on solubility
- (4) Based on separation of particles on size
- 84. What is the role of Argonaute proteins in RNA interference pathways ?
 - (1) They facilitate the processing of precursor miRNAs into mature miRNAs.
 - (2) They recognize and bind to specific siRNAs or miRNAs.
 - (3) They methylate DNA at specific CpG sites.
 - (4) They mediate histone acetylation and deacetylation.
- 85. What do you mean by "Trophophase" ?
 - (1) Production of waste materials
 - (2) Production of topical products
 - (3) Production of primary metabolites
 - (4) Production of secondary metabolites
- PHD-EE-2023-24/(Bio-Technology Engineering)(SET-Y)/(D)

- **86.** Which of the following is an upstream process ?
 - (1) Product recovery
 - (2) Product purification
 - (3) Media formulation
 - (4) Cell lysis
- 87. In fed-batch culture, the feed solution is :
 - (1) Less concentrated
 - (2) Highly concentrated
 - (3) Highly diluted
 - (4) Diluted
- 88. Which one of the following is *not* included in the mechanism of bioleaching ?
 - (1) Acidolysis
 - (2) Complexolysis
 - (3) Redoxolysis
 - (4) Hydrolysis
- 89. Which of the following has less organic matter load?
 - (1) Marshlands
 - (2) Marine sediments
 - (3) Landfill sites
 - (4) Fresh water
- 90. The inherent ability of an animal to navigate towards an original location through unfamiliar areas.
 - (1) Homing
 - (2) Navigation
 - (3) Re-routing
 - (4) Walking

D

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- **91**.

Electrochemical biosensors that transduce the biological recognition events caused by electroactive species at the sensing surface into a current signal for the quantification of

- (1) Amperometric
- (2) Dielectric
- (3) Immuno
- (4) Matrix
- 92. If screening is carried out on the basis of sequences which are related to the desired sequence, then the process is known as :
 - (1) in-silico
 - (2) homologue search
 - (3) annotation
 - (4) partial search
- 93. Sometimes the required mRNA is present in less number. So the process of increasing the representation of rare mRNAs is known as :
 - (1) amplification (2) normalization
 - (3) selection (4) narrowing
- 94. For cloning purposes, the intact chromosomes should be separated by :
 - (1) agarose gel electrophoresis
 - (2) fluorescence-activated sorter
 - (3) polyacrylamide gel electrophoresis
 - (4) chromatography
- The process of examining stained chromosomes in a light microscope and removing 95, appropriate regions with a micro-manipulator is called as :
 - (2) chromosome sorting (1) microdissection
 - (4) chromosome jumping
 - (3) chromosome walking
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- 96. What do we mean by housekeeping genes ?
 - (1) Housekeeping genes are those genes which are specific to an organism
 - (2) Housekeeping genes are those genes which are present in all the organisms
 - (3) Housekeeping genes are those genes which are meant for repair and maintenance in a species of organism
 - (4) Housekeeping genes are those genes which required for the replication process
- 97. Which type of bioreactor configuration is typically used for large-scale industrial production of microbial products?
 - (1) Stirred tank bioreactor
 - (2) Air-lift bioreactor
 - (3) Packed-bed bioreactor
 - (4) Fluidized-bed bioreactor
- 98. In bioprocess engineering, what is the primary purpose of a chemostat?
 - (1) To maintain a constant concentration of substrate
 - (2) To maintain a constant volume of culture
 - (3) To measure the growth rate of microorganisms
 - (4) To control temperature and pH
- Which of the following is not a commonly used method for measuring biomass 99. concentration in a bioreactor ?
 - (1) Turbidity measurement (2) Dry cell weight determination
 - (3) Optical density measurement (4) Viscosity analysis
 - In marker-assisted breeding, what is the purpose of fine mapping ?

 - (1) To identify quantitative trait loci (QTLs) associated with complex traits
 - (2) To refine the physical location of a gene of interest within a chromosome region (3) To analyze the genetic diversity within a population
 - (4) To assess the heritability of traits in different environments

100.

Answer keys of PHD-EE-2023-24 (BIOTECH ENGG.) entrance exam dated 22.03.2024						
Q. NO.	A	В	С	D		
1	3	3	2	4		
- 2	2	2	3	3		
3	4	4	3	2		
4	2	2	2	3		
5	3	2	3	1		
6	3	2 ,	4	4		
7	3	3	2	4		
8	4	2	1	1		
9	4	3	4	3		
10	1	3	2	2		
11	1	3	4	3		
12	3	1	1	1		
13	2	2	3	1		
14	2	1	4	3		
15	1	4	2	3		
16	2	1	1	2		
17	1	2	4	1		
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44	2	4	2	1		
45	2	2	. 1	3		
46	2	1	2	1		
47	3	4	1	2		
48	2	2	1	1		
49	3	2	4	4		
50	3	2	2	4		

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Answer	keys of PHD-EE-2023-2	4 (BIOTECH ENGG.) er	ntrance exam dated 22	2.03.2024
Q. NO.	A	В	С	D
51	4	3	3	3
52	1	3	1	1
53	3	4	1	3
54	4	1	3	4
55	2	3	3	2
56	1	1	2	1
57	4	2	1	3
58	2	1	4	2
59	2	4	3	1
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62	3	3	2	2
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85	2	2	1	3
86	1	1	4	3
87	3	3	4	3
88	2	2	1	4
89	1	1	3	4
90 -	3	3	2	1
91	4	3	3	1
92	3	1	3	3
93	2	1	4	2
94	3	3	1	2
95	1	3	3	1
96	4	2	1	2
97	4	1	2	1
98	1	4	1	1
99	3	3	4	4
100	2	2	4	2

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