



# Punjab Technical University

Maximum Marks: 90

Time: 90Mins.

## Entrance Test for Enrollment in Ph.D Programme

### Important Instructions

- Fill all the information in various columns, in Capital letters, with blue/black point pen for attempting the questions
- Use of calculators is not allowed.
- Make attempt by writing the answer in capital Letters in the box against each question number.
- All questions are compulsory. Each Question has only one right answer. No Negative marking for wrong answers.
- Questions attempted with two or more options/answers will not be evaluated.

**Stream:** .....Life Sciences .....

**Discipline** .....Biotechnology .....

**Name** .....

**Fathers Name** .....

**Roll Number** **Date: 13-07-2014**

**Signature of Candidate:** .....

**Signature of Invigilator** .....

1. A molecular technique in which DNA sequences between two oligonucleotide primers can be amplified is known as

- (A) southern blotting
- (B) northern blotting
- (C) polymerase chain reaction
- (D) DNA replication

2. In genetic engineering, a chimera is

- (A) an enzyme that links DNA molecules
- (B) a plasmid that contains foreign DNA
- (C) a virus that infects bacteria
- (D) a fungi

3. Chargaff, in analyzing DNA found that the amount of
- (A) cytosine equaled that of guanine.
  - (B) cytosine equaled that of thymine.
  - (C) cytosine equaled that of adenine.
  - (D) each nucleotide was unrelated.
4. Insertional inactivation of a gene helps in
- (A) Identification of recombinant clones
  - (B) Identification of deletion mutants
  - (C) Identification of suppression mutants
  - (D) elimination of recombinant clones
5. Which of the following is the best method to determine bacteriophages concentration in a sample?
- (A) Spectrophotometry
  - (B) Plaque assay
  - (C) Copy assay number
  - (D) Light microscopy
6. Electroporation facilitates introduction of foreign DNA into the target organism by
- (A) Changing the porosity of the cell wall
  - (B) Changing the electric potential of the cell wall
  - (C) Lysis of the cell wall
  - (D) Active transport across the cell wall
7. Among the following which is considered as the best indicator of water pollution
- (A) *Bacillus*
  - (B) *Clostridium*
  - (C) *E.coli*
  - (D) *Paramecium*

8. Transduction has been used extensively for genome mapping for bacteria, which of the following process is useful for gene mapping?

- (A) bacterial lysis
- (B) generalised transduction
- (C) specialized transduction
- (D) site specific recombination

9. The distance between two successive nitrogenous base pairs is

- (A) 34 Å
- (B) 36 Å
- (C) 20 Å
- (D) 3.4 Å

10. Dolly sheep was genetically similar to

- (A) The mother from which nucleated fertilized egg was taken
- (B) The mother from which nuclear DNA of udder cell was taken
- (C) The surrogate mother
- (D) Both surrogate mother and nuclear donor mother

11. Which of the following is not involved in enzyme regulation?

- (A) Covalent modification
- (B) Competitive inhibition
- (C) Suicide inhibition
- (D) Allosteric activation

12. The major protein responsible for the storage of iron

- (A) Ferredoxin
- (B) Ferretin
- (C) Hemosiderine
- (D) Transferine

13. Sulphur containing amino acids are

- (A) Cysteine and methionine
- (B) Methionine and threonine
- (C) Cysteine and threonine
- (D) Cysteine and serine

14. If the bacteria doubles itself in 5 minutes, what would be number of bacteria at end of 20 minutes if you start with 4 bacteria (June 2006)

- (A) 64
- (B) 32
- (C) 48
- (D) None of the above

15. Sendai virus enters host cell by

- (A) phagocytosis
- (B) Receptor mediated endocytosis
- (C) cell fusion
- (D) cell fusion

16. Which of the following transgenic crops occupies the largest area in the world?

- (A) Herbicide tolerant soybean
- (B) Herbicide tolerant maize
- (C) Insect resistant cotton
- (D) Insect resistant potato

17. Independently folded functional unit of a protein is called a

- (A) motif
- (B) fold
- (C) domain
- (D) module

18. Which one of the following antibiotics attaches to 50S ribosome and inhibits peptidyl-transferase activity?

- (A) Penicillin
- (B) Chloramphenicol
- (C) Trimethoprim
- (D) Amphotericin

19. To produce plants that are homozygous for all traits, the best choice is

- (A) cell suspension culture
- (B) callus culture
- (C) anther/ pollen culture
- (D) plant organ culture

20. cis-trans isomerization of the peptide bond preceding an amino acid X is known to be critical in the folding of proteins by slowing down the folding reaction. The amino acid X is

- (A) isoleucine
- (B) tryptophan
- (C) proline
- (D) Histidine

21. Which of the following plant hormones is synthesized from an amino acid precursor?

- (A) Ethylene
- (B) Auxins
- (C) Cytokinin
- (D) Abscisic acid

22. Which of the following cells secrete Eselectins?

- (A) Eosinophils
- (B) Endothelial cells

- (C) Microglial cells
  - (D) Epithelial cells
23. *Xenopsylla cheopis* is the vector for
- (A) Indian tick typhus
  - (B) Epidemic typhus
  - (C) Plague
  - (D) Kala azar
24. In which of the following cases, the enzyme substrate complex is irreversible in nature?
- (A) Competitive inhibition
  - (B) Non-competitive inhibition
  - (C) Un-competitive inhibition
  - (D) Both competitive and non-competitive inhibition
25. Cholesterol contributes to which of the following properties of biological membranes?
- (A) Membrane rigidity
  - (B) Membrane fluidity
  - (C) Membrane permeability
  - (D) Membrane osmolarity
26. Regulation of fatty acid biosynthesis occurs at the enzymatic step catalyzed by
- (A) carnitine acyltransferase I
  - (B) acetyl CoA carboxylase
  - (C) pyruvate carboxylase
  - (D) citrate synthase
27. Which among the following viruses is known for its antigenic variation?
- (A) Rabies
  - (B) Influenza

- (C) Yellow fever
  - (D) Japanese encephalitis
28. Homology modelling can be used to predict the 3D structure of only
- (A) paralogs
  - (B) orthologs
  - (C) xenologs
  - (D) homologs
29. PRINTS database contains
- (A) Single motifs
  - (B) Multiple motifs
  - (C) Single domains
  - (D) Multiple domains
30. Which of the following is NOT found inside the eukaryotic nucleus?
- (A) Nucleolus
  - (B) Cajal bodies
  - (C) PML bodies
  - (D) Centrosomes
31. In cell cycle, paternal and maternal chromosomes exhibit a “bouquet stage” during
- (A) Leptotene
  - (B) Zygotene
  - (C) Pachytene
  - (D) Diplotene
32. Mitochondria are involved in the following except
- (A) ATP production
  - (B) Glycosylation
  - (C) Fatty acid biosynthesis
  - (D) TCA cycle

33. The complete denaturation of a protein leads to a loss of the following structure(s):
- (A) primary
  - (B) primary and tertiary
  - (C) primary and secondary
  - (D) secondary and tertiary
34. The 20 different amino acids found in proteins are normally coded by
- (A) 59 codons
  - (B) 60 codons
  - (C) 61 codons
  - (D) 63 codons
35. The E-value in a BLAST search measures
- (A) the probability that the search result is non-random
  - (B) the significance of the search result
  - (C) the probability that the search result is obtained randomly
  - (D) the reliability of the search
36. Which one of the following organisms is used in Ames test?
- (A) *E. coli*
  - (B) *Streptococcus aureus*
  - (C) *Pseudomonas aerogenosa*
  - (D) *Salmonella typhimurium*
37. The active site of an enzyme remains
- (A) At the center of globular proteins
  - (B) Rigid and does not change shape
  - (C) Complementary to the rest of the molecule
  - (D) None of the above



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

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

39. An Rh-negative woman married to a heterozygous Rh-positive man has three children. The probability that all three of their children are Rh-positive is

- A. 1:2.
- B. 1:4.
- C. 1:8.
- D. zero.

40. Which one of the following properties of antibodies is NOT dependent on the structure of the heavy-chain constant region?

- A. ability to cross the placenta
- B. isotype (class)
- C. ability to fix complement
- D. affinity for antigen

41) SDS is used in polyacrylamide gel electrophoresis of a mixture of proteins for their efficient separation on the gel. SDS, in this experiment, is used to

- A) Solubilise the protein
- B) Stabilize the protein
- C) decrease the surface tension of buffer
- D) have uniform charge density on the proteins

42. Which one of the following statements are not attributed to plasmids

- (A). they are circular DNA molecule
- (B). they have antibiotic resistant genes
- (C). they have the ability of autonomous replication
- (D) None of the above.

43. Which organism was used as bio weapon derived from\_\_\_\_\_.
- (A) Clostridium
  - (B) Yerstsinia pestis
  - (C) Fusarium species
  - (D) Green algae
44. When immune complexes from the serum are deposited on glomerular basement membrane, damage to the membrane is caused mainly by
- (A) gamma interferon.
  - (B) phagocytosis.
  - (C) cytotoxic T cells.
  - (D) enzymes released by polymorphonuclear cells.
45. Three dimensional shape of tRNA is
- (A) L-shaped
  - (B) Clover leaf-like
  - (C) X-shaped
  - (D) Y-shaped
46. The class of immunoglobulin present in highest concentration in the blood of a human newborn is
- (A). IgG.
  - (B). IgM.
  - (C). IgA.
  - (D). IgD.
47. Variations observed during tissue culture of some plants are known as
- (A) Clonal variations
  - (B) Somatic variations
  - (C) Somaclonal variations
  - (D) Tissue culture variations

48. The study of all the proteins coded by the genome is called
- (A) Proteome
  - (B) Proteomics
  - (C) Genome
  - (D) Protein formation
49. A method for transferring protein to a nitrocellulose filter on which protein can be detected by a suitable probe is:
- A) Southern blotting
  - B) Northern Blotting
  - C) Western blotting
  - D) None of these
50. Which of the following is the best method to determine bacteriophages concentration in a sample?
- A) Spectrophotometry
  - B) Plaque assay
  - C) Copy assay number
  - D) Light microscopy
51. Which one of these statistics is unaffected by outliers?
- A. Mean
  - B. Interquartile range
  - C. Standard deviation
  - D. Range
52. One use of a regression line is
- (A) to determine if any x-values are outliers.
  - (B) to determine if any y-values are outliers.
  - (C) to determine if a change in x causes a change in y.
  - (D) to estimate the change in y for a one-unit change in x.

53) A coin is tossed 1000 times and 540 heads appear. The P-value of the hypothesis testing to test the claim that this is not a biased coin is (correct to 3 decimal places)

- (A) .001
- (B) .011
- (C) .11
- (D) .206

54) A certain confidence interval of population proportion  $p$  is  $0.35 < p < 0.48$ . Then the sample proportion and margin of error are (correct to 3 decimal places)

- (A) 0.83 and 0.13
- (B) 0.415 and 0.065
- (C) 0.83 and 0.065
- (D) 0.415 and 0.13

55. All are plant derived elicitors except

- (A) chitin
- (B) pectin
- (C) cellulose
- (D) pectic acid

56. The cell line used for the production of polio vaccine was

- (A) Primate kidney cell line
- (B) CHO cell line
- (C) Dog kidney cell line
- (D) mouse fibroblast cell line

57. To obtain haploid plant, we culture

- (A) Entire anther
- (B) Nucleus
- (C) Embryo
- (D) Apical bud

58. During which stage of wastewater treatment is the primary effluent aerated to allow for biodegradation by aerobic microbes?

- (A) Sedimentation
- (B) Secondary treatment
- (C) Sludge digestion
- (D) Disinfection
- (E) Primary treatment

59. Bioaugmentation is a process that involves:

- (A) Using plants for bioremediation
- (B) Bioventing
- (C) Sludge removal
- (D) Adding microbes to a cleanup site
- (E) Ex situ

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61. Which of the following mutations would be easiest to revert:

- (A) an insertion of 10 base pairs
- (B) a deletion of more than 10 base pairs
- (C) a base pair substitution
- (D) insertion of a transposon

62. Which polymerase made widespread use of PCR possible:

- (A) DNA polymerase I
- (B) *Thermus aquaticus* (Taq) polymerase

(C)DNA polymerase III

(D)none of the above

63) The typical temperature for an autoclave (operating at 15pounds per square inch of pressure) is

(A)121°C

(B)100°C

(C)63°C

(D)73°C

(E)200°C

64) Chromosomal transfer occurs during conjugation only if:

(A) the F factor is integrated into the chromosome

(B) both cells are donors

(C) pili are absent

(D) mutations occur simultaneously

65 If a relationship between two variables is called statistically significant, it means the investigators think the variables are

(A). related in the population represented by the sample.

(B). not related in the population represented by the sample.

(C). related in the sample due to chance alone.

(D). very important

66 Which group of enzymes are popularly called “Molecular stichers”

(A). restriction Endonuclease

(B). ligases

(C). RNA polymerase

(D). DNA polymerase

67. What is the probability that a randomly selected student is a male, given that the person consistently exceeds the speed limit?

A)  $\frac{76}{128}$

B)  $\frac{76}{225}$

C)  $\frac{115}{225}$

D)  $\frac{128}{225}$

68. If  $x$  is 48, Median is 47, Mode value will be


(A) 44

(B) 50

(C) 45

(D) 49

69. What does it mean when you calculate a 95% confidence interval?

A) The process you used will capture the true parameter 95% of the time in the long run 

(B) You can be “95% confident” that your interval will include the population parameter

(C) You can be “5% confident” that your interval will not include the population parameter

(D) All of the above statements are true

70. Find variance for the random variable  $x$  that has the probability density

$$f(x) = x/2 \text{ for } 0 < x < 1 \text{ } 0 \text{ elsewhere}$$

- (A) 1/9
- (B) 2/9
- (C) 4/9
- (D) 5/9

71. . An increase  $T_m$  (melting temperature) for a ds-DNA may be due to high content of

- (A) A+G
- (B) A+T
- (C) C+G
- (D) None of the above

72. Functions of nucleotide includes

- (A) information storage and transmission
- (B) storage of chemical energy
- (C) cell signalling
- (D) All of the above

73. Rennet is used in

- (A) bread making
- (B) fermentation
- (C) cheese making
- (D) antibiotics synthesis

74. Tissue plasminogen activator is

- (A) a vitamin
- (B) an Enzyme
- (C) a chemical that stimulates tissue differentiation
- (D) amino acid



75. A bioreactor is
- A) hybridoma
  - B) Culture containing radioactive isotopes
  - C) Culture for synthesis of new chemicals
  - D) Fermentation tank
76. Which of the following is a protein sequence database
- (A) DDBJ
  - (B) EMBL
  - (C) GenBank
  - (D) PIR
77. The information retrieval tool of NCBI GenBank is
- A) Entrez
  - (B) STAG
  - (C) SeqIn
  - (D) text search
78. The main idea behind PCR is
- (A) the cloning of one's entire DNA sequence to create genetically similar organisms
  - (B) the combination of two different organism's DNA
  - (C) the amplification of a specific region of the DNA for further study
  - (D) the extraction of DNA from a cell to genetically sequence an organism's DNA
79. If a free phosphate is found at the 5' end of a DNA strand, what is found at the other end of the same strand?
- (A) A hydroxyl group on the 5' carbon of a deoxyribose sugar.
  - (B) A hydroxyl group on the 3' carbon of a deoxyribose sugar.

- (C) A phosphate group on the 5' carbon of a deoxyribose sugar.
- (D) A phosphate group on the 3' carbon of a deoxyribose sugar.
- (E) A base attached to the 3' carbon of a deoxyribose sugar.

80. Each cell in an individual with Down syndrome contains \_\_\_\_ chromosomes.

- (A) 47
- (B) 22
- (C) 24
- (D) 45

80. Chargaff found that for DNA

- (A) the ratio of A to C is close to 1:1 and the ratio of G to T is close to 1:1
- (B) the ratio of A to T is close to 1:1 and the ratio of G to C is close to 1:1
- (C) the ratio of A to G is close to 1:1 and the ratio of T to C is close to 1:1
- (D)  $A + T = G + C$

81. From one pyruvate passing through Krebs's cycle, how many NADH are formed?

- (A) 1
- (B) 2
- (C) 3
- (D) 4

82. Cellular respiration is essentially a/an \_\_\_\_\_ process.

- (A) Oxidation.
- (B) Reduction.
- (C) Redox.
- (D) None of the above.

83. A culture started with 4 cells and ended with 128 cells. How many generations did the cells go through:

- (A) 64
- (B) 32
- (C) 6
- (D) 5

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

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

85. The anticodon is in:

- (A) DNA
- (B) mRNA
- (C) tRNA
- (D) rRNA

86. Rifampicin is a specific inhibitor of

- (A) Bacterial RNA polymerase
- (B) RNA polymerase II
- (C) RNA polymerase I
- (D) RNA polymerase III

87. Dye injected into a plant cell might be able to enter an adjacent cell through

- (A) tight junction
- (B) plasmodesma

- (C) microtubule
- (D) desmosome

88. A child stung by a bee experiences respiratory distress within minutes and lapses into unconsciousness. This reaction is probably mediated by

- (A). IgE antibody.
- (B). IgG antibody.
- (C). sensitized T cells.
- (D). complement.

89. Graft and tumor rejection are mediated primarily by:

- (A) non-complement-fixing antibodies.
- (B) phagocytic cells.
- (C) helper T cells.
- (D) cytotoxic T cells.

90. The conformational change in an enzyme after the substrate is bound that allows the chemical reaction to proceed, can be explained by

- (A) induced fit
- (B) transition
- (C) fit and fine
- (D) Pasteur