# Grassroots Academy
# New Delhi



# NET JRF TEST 12

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**TEST-12**

**Principals and applications of Gel Filtration, Ion Exchange and affinity Chromatography, Thin layer and Gas chromatography, HPLC, Principals and applications, Nucleic Acid Hybridization and cot curve, Sequencing of Proteins and nucleic acid, Southern, South-western, northern blotting, PCR.**

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1. Transfer of electrophoretically separated proteins onto a membrane for probing with antibody?
   a) northern blotting
   b) southern blotting
   c) eastern blotting
   d) western blotting

2. The age of an ink may be determined by utilizing an ink library based on analysis by?
   a) X-ray diffraction.
   b) Thin-layer chromatography.
   c) IR spectrophotometry.
   d) Gas chromatography-mass spectrometry.

3. Gel filtration chromatography is also known as
(a) ion exchange chromatography
(b) Size exclusion chromatography
(c) affinity chromatography
(d) all the above

4. The column of HPLC is made up of which of the following material
(a) copper
(b) aluminium
(c) PTFE
(d) all the above

5. The compounds will move further in thin layer chromatography plate are usually?
(a) polar solvent
(b) non-polar solvent
(c) both
(d) none

6. Why PCR known as a chain reaction?
(a) the product recycles to form half of the original amount
(b) the products become substrates of sub-sequence cycle of synthesis
(c) both
(d) none

7. Microarray technology is an evolved form of?
(a) Northern blotting
(b) Southern blotting
(c) Western blotting
(d) Genetic fingerprinting

8. To finish the purification step you prepare an affinity column using AMP bound to the column resin (beads). Which of the following methods would be the best to remove the bound protein from the column?
(a) Washing the column with AMP.
(b) Changing the pH.
(c) Washing the column with high salt.
(d) Washing the column with distilled water.

9. Which among the following is not required for a polymerase chain reaction?
(a) Primers complementary to DNA
(b) Target DNA template
(c) Buffer solution
(d) none

10. Which of these would be an example of subcloning?
(a) Part of the insert from a hybrid vector is inserted into a different vector.
(b) A recircularized vector is digested with a second restriction enzyme.
(c) Several different restriction enzymes are used to cut a hybrid vector, individually and in combinations.
(d) all the above

11. All methods of DNA fingerprinting depend on some variation of what strategy?
(a) Gene therapy
(b) RFLP
(c) Microarray analysis
(d) Nucleic acid hybridization

12. A single step that is occasionally performed at 70-74$^{o}$C temperature for 5-15 minutes after the last PCR cycle is called as?
(a) Annealing step
(b) Denaturation step
(c) Elongation step
(d) Final elongation step

13. RT-PCR which is used to amplify, isolate or identify a known sequence from --------?
(a) One strand of the original DNA
(b) Internal sequence of a DNA
(c) A single base differences in DNA
(d) A cellular or tissue RNA

14. Which among the following is used as buffer in anion exchange chromatography?
(a) triethanolamine
(b) N-methyl piperazine
(c) bis-Tris propane
(d) all the above

15. in a gel filtration column which of this process occur?
(a) Large proteins elute first.
(b) Smaller proteins enter the beads more readily.
(c) both
(d) Large proteins enter the beads more readily.

16. Which of the following solvents is more polar?
(a) ethyl acetate
(b) hexanes
(c) kinases
(d) carbomyl phosphate

17. Who invented the techniques of northen blotting?
(a) Northen
(b) Southern
(c) Alwine
(d) Snell

18. What would happen if the concentration of dideoxynucleotides was too high in a chain termination sequencing reaction?
(a) The reaction would yield very short molecules
(b) The reactions would yield very long molecules and there would be little sequence data close to the primer
(c) The reactions would not proceed as the high concentrations of dideoxynucleotides would inhibit the DNA polymerase
(d) The fluorescence of the sequencing products would be too high and difficult to read

19. Which of the following techniques is useful for determining the tertiary structure and quaternary structure of purified proteins?

(a) Size exclusion chromatography
(b) gel filtration chromatography,
(c) gel permeation chromatography
(d) all the above

20. Which of the following technique is used to identify the unknown bacterium?
(a) PCR
(b) western blotting
(c) chromatography
(d) electrophoresis

21. The creation of a DNA fingerprint involves all but which of the following techniques?
(a) Western blotting
(b) Southern blotting
(c) Polymerase chain reaction
(d) Gel electrophoresis

22. Bio technique which is used for the purification of nucleic acids, proteins and antibodies is?
(a) gel electrophoresis
(b) affinity chromatography
(c) gas chromatography
(d) Thin layer chromatography

23. During PCR why is DNA heated at 90$^{o}$C ?
(a) to minimize the reactivity of DNA
(b) To dentaure the two strands
(c) to decrease its length
(d) all the above

24. Slowing down of the reaction at one phase because of the DNA polymerase activity loss and as consumption of reagents such as dNTPs and primers become limiting is called as?
(a) Leveling off stage
(b) Exponential amplification
(c) Plateau
(d) Final hold

25. What is the wavelength of UV/VIS spectrophotometers popular detector in HPLC?
(a) 500-700nm
(b) 200-800nm

(c) 800-1200nm
(d) 100-150nm

26. In a PCR for site directed mutagenesis introduction of mutations is achieved through
(a) Aldolase
(b) Primers
(c) virus
(d) none

27. Which of the following statements are true regarding PCR?
(a) Exponential amplification occurs in PCR
(b) PCR is more sensitive than branched DNA assays
(c) Linear amplification occurs in branched DNA
(d) all the above

28. The synthetic unit of the polymerase chain reaction is called as?
(a) ligase
(b) annealer
(c) amplicon
(d) primer

29. Why is taq polymerase used in PCR?
(a) to detact DNA polymerase
(b) to insert DNA polymerase
(c) to detact RNA polymerase
(d) all the above

30. PCR is advantageous for all but the following reason?
(a) PCR is a very rapid technique for the isolation of a gene
(b) PCR does not require that the sequence of the gene is known
(c) PCR requires very small amounts of starting DNA
(d) PCR is useful for mapping DNA markers

31. Tools to detect polymorphism in plants are _____ maps.
(a) AFLP and PCR
(b) RFLP and QTL
(c) PCR and QTL
(d) RFLP and AFLP

32. Consider the DNA sequence ACCACGA. Which of the following sequences would be considered complementary to this strand?

(a) GTTGTAG
(b) ACCACGA
(c) CAACATC
(d) TGGTGCT

33. The flow rate at which HPLC works is
(a) 50mm/min
(b) 600mm/min
(c) 400mm/min
(d) 15000mm/min

34. Chromosome walking requires which among the following?
(a) requires overlapping cloned sequences
(b) allows one to move from one chromosome to another
(c) requires FISH
(d) requires pedigree analysis

35. A specific gene characteristic of a microbial pathogen can be identified in a clinical specimen by using a?
(a) direct ELISA assay
(b) fluorescent antibody
(c) Western blot
(d) nucleic acid probe

36. A PCR that allows the building of a DNA sequence with a mutation beyond the limit of the highest sensible primer length is called as?
(a) TAIL-PCR
(b) RT-PCR
(c) Inverse PCR
(d) Overlap-extension PCR

37. What type of probe would you use for a Western blot experiment?
(a) An RNA molecule.
(b) A known DNA sequence.
(c) A purified protein.
(d) An antibody.

38. Name the type of PCR which is used to study the conversion of RNA to cDNA in order to determine the expression of a gene or to identify the sequence of an RNA transcript is known as?
(a) TAIL-PCR

(b) RT-PCR
(c) Inverse PCR
(d) Overlap-extension PCR

39. Thin Layer Chromatography is generally used as a qualitative analytical technique for?
(a) checking the purity of a compound
(b) determining the number of components in a mixture
(c) following the course of a reaction
(d) All the above

40. A standard Polymerase Chain Reaction (PCR) consists of?
(a) Mg++ ions
(b) dNTPs
(c) Taq polymerase
(d) all the above

41. Name the process that allows the separation of ions and polar molecules based on the charge properties of the molecules?
(a) ion exchange chromatography
(b) affinity chromatography
(c) gas chromatography
(d) Thin layer chromatography

42. Which of the steps listed below is not involved in Northern analysis?
(a) Purify the RNA
(b) Blot the RNA from the gel to a filter
(c) Make cDNA using reverse transcriptase
(d) Separate the RNA by size in an electrical field in an agarose gel

43. If several compounds are present in a sample which is developed on a thin layer chromatography (TLC) plate, a column of spots is seen on the developed plate, with?
(a) more polar compounds toward the bottom of the plate and less polar toward the top
(b) more polar compounds toward the top of the plate and less polar toward the bottom
(c) lower boiling compounds toward the bottom of the plate and higher boiling toward the top
(d) lower boiling compounds toward the top of the plate and higher boiling toward the bottom

44. After disrupting the yeast cells, which of the following might you add to stabilize the protein?
(a) Protease Inhibitor.
(b) NaCl
(c) ATP.
(d) all the above

45. Which of the following is a Modification of a standard PCR?
(a) RT-PCR (Reverse transcription PCR)
(b) Nested PCR
(c) Quantitative PCR
(d) all the above

46. Separation of charged molecules are separated based on varying rates of migration through a solid matrix when subjected to an electric field?
(a) gel electrophoresis
(b) photoreactivation
(c) autoradiography
(d) chromatography

47. Who first described the technique of southwestern blotting techniques?
(a) Alwine
(b) B. Bowen
(c) Snell
(d) Southern

48. Which of the following is an application of the PCR?
(a) studies of infectious diseases
(b) genetic diagnosis
(c) used in forensic science
(d) all the above

49. In order to achieve both heating and cooling of the block holding the PCR tubes simply by reversing the electric current for running an automated PCR, it uses
(a) Heliox equipment
(b) Peltier effect
(c) Pyroelectric effect
(d) Thermoacoustic technique

50. What would be the best way to determine the location of this protein in the column fractions?

(a) Changes in the refractive index.
(b) UV absorption.
(c) Measure the rate of ATP synthesis.
(d) SDS gel electrophoresis of the protein.

51. Which of the following is used in Chromosome walking?
(a) Occurs in mitosis
(b) Can be used to close sequence gaps
(c) Requires a genomic DNA library
(d) Is always done by PCR

52. Chromatographic method of separating biochemical mixtures, based on a highly specific biologic interaction such as that between antigen and antibody is called?
(a) Gas chromatography.
(b) affinity chromatography
(c) thin layer chromatography
(d) paper chromatography

53. Which of the following statements regarding the polymerase chain reaction is not true?
(a) It has the potential of diagnosing an infection from a single copy of a gene
(b) It can increase the amount of DNA in a sample
(c) It utilizes DNA polymerases from psychrophilic organisms
(d) It can amplify DNA of only a few base pairs up to a whole genome

54. PCR is used for?
(a) digesting proteins
(b) reverse transcribing RNA into DNA
(c) copying plasmids
(d) digesting DNA

55. Commonly used cationic exchange chromatography resins are?
(a) R-resins
(b) S-resins
(c) Q-resins
(d) all the above

56. When the desalted protein solution from the gel filtration column is next applied to an ion exchange column. The best results are expected from a column that contains?
(a) anion exchange resin, pH 3.0.
(b) anion exchange resin, pH 7.0.

(c) cation exchange resin, pH 7.0.
(d) cation exchange resin, pH 8.0.

57. Which of the following is an example of lectins which can bind specific carbohydrate (sugar) molecules during affinity chromatography?
(a) FGAMR synthetase
(b) concanavalin A
(c) RNAase H
(d) TP53

58. The main technique used to analyse samples suspected of containing liquid fire accelerants is
(a) Gas chromatography.
(b) Thin-layer chromatography.
(c) ultraviolet-visible spectroscopy
(d) all of the above

59. Who invented the technique of affinity chromatography ?
(a) Pedro Cuatrecasas and Meir Wilchek
(b) Robert corry&pauling
(c) Sarah Ratner&philip cohen
(d) Snell&david

60. The fractions obtained from the ion exchange column are nearly pure BC-1ase. To estimate the homogeneity of the preparation which of the following tests are suitable?
a) SDS-PAGE.
b) polyacrylamide gel electrophoresis (PAGE)
c) isoelectric focusing.
d) all the above

61. Which of the following is used in Chain termination DNA sequencing?
a) Uses trideoxynucleotides
b) Requires a DNA polymerase
c) Requires only one primer
d) Degrades DNA before sequencing

62. The pressure which is applied to HPLC is?
(a) upto1000psi
(b) upto8000psi
(c) upto50psi
(d) upto5000psi

63. The subunit molecular weight as well as the number of subunits in the quaternary structure can be determined by
(a) Gel filtration chromatography.
(b) SDS-PAGE electrophoresis.
(c) both
(d) Isoelectric focusing.

64. Why are DNA polymerases from thermophilic organisms used in the polymerase chain reaction?
(a) Because they cannot add new nucleotides at low temperatures
(b) Because they are required to keep the two strands separated
(c) Because the primers will not attach to a complementary sequence unless the polymerases warm the reaction tube
(d) Because the priming and extension steps must be carried out at high temperatures to prevent the single strands from reannealing

65. The ease with which nitroglycerine can be caused to explode means that it can be analysed by which biotechniques?
(a) HPLC
(b) Gas chromatography
(c) both
(d) Thin layer chromatography

66. A common screen test for the presumptive identification of an explosive is
(a) X-ray diffraction.
(b) Thin-layer chromatography.
(c) IR spectrophotometry.
(d) Gas chromatography-mass spectrometry.

67. Which of the following is not essential to carry out the polymerase chain reaction?
(a) DNA polymerase
(b) primers
(c) gel electrophoresis
(d) high temperature

68. Which among the following is used as buffer in cationic exchange chromatography?
(a) citric acid
(b) Maleic acid
(c) formic acid
(d) all the above

69. Size exclusion chromatography is the official technique for the molecular weight comparison of different commercially availability ----------?
(a) resines
(b) heparins.
(c) histones
(d) all the above

70. Name the type of HPLC which works based on the polarity of the compound?
(a) Reversed phase HPLC
(b) Normal phase HPLC
(c) gel permeation chromatography
(d) Ion exchange chromatography

71. Which of the following is an advantage of affinity chromatography?
(a) Reduce the amount of a molecule in a mixture
(b) Purify and concentrate a molecule from a mixture into a buffering solution
(c) Discern what biological compounds bind to a particular molecule, such as drugs
(d) all the above

72. A type or a variation of PCR that is used to find single-nucleotide polymorphisms (SNPs) provided that have a preceding knowledge of a DNA sequence is known as
(a) Inverse PCR
(b) Direct mutagenesis PCR
(c) Allele-specific PCR
(d) Polymerase Cycling Assembly

73. Nucleic acid hybridization is a powerful tool for the detection of specific organisms. Why is it such a specific indicator?
(a) nucleic acids are more stable than proteins allowing a harsh handling regime
(b) the probe technology is very sensitive, allowing detection of low levels of bacteria
(c) the presence of specific DNA sequences belonging to specific bacteria can be identified
(d) all of the above

74. A beaker will be used as a "developing jar" in TLC experiment. When the TLC plate is set in this beaker, the solvent in the beaker must be:
(a) deep enough to cover the entire TLC plate
(b) above the pencil line used to guide the spotting of samples
(c) deep enough to come about halfway up the TLC plate
(d) below the pencil line used to guide the spotting of samples

75. In the Sanger method of DNA sequencing, what causes the termination of chain elongation?
(a) The incorporation of a dideoxynucleotide
(b) The incorporation of a regular DNA nucleotide
(c) Denaturation of the double-stranded test fragments
(d) When the DNA polymerase encounters a stop codon

76. The sequence of the amino acids in a protein is referred to as?
(a) the primary structure.
(b) the tertiary structure.
(c) the quarternary structure.
(d) the secondary structure.

77. Which phase of the ion exchange chromatography is displays ionic functional groups (R-X) that interact with analyte ions of opposite charge.
(a) mobile
(b) stationary
(c) both
(d) none

78. Which of the following soils will have the highest cation exchange capacity (CEC)?
(a) a soil with a high sand content and high humus content
(b) a soil with a high clay content and low humus content
(c) a soil with a high silt content and high clay content
(d) a soil with a high clay content and high humus content

79. A scientist has a processed mRNA transcript for a gene he/she wants to clone into a bacterial vector. What must he/she do as a first step in this process?
(a) Generate primers to the processed mRNA
(b) Use PCR to create a cDNA molecule
(c) Sequence the mRNA transcript
(d) Digest the mRNA and cloning vector with the same restriction endonuclease

80. All of the following were outcomes of Avery's experiment on "the active principle" except
(a) protein digesting enzymes did not affect the sample
(b) The array of the elements of purified principle agreed closely with DNA and the principle centrifuged to the same level as DNA.
(c) the extraction of lipids and proteins from the principle only slightly reduced its activity

(d) DNA-digesting enzyme, DNase, destroyed all transcription activity.

81. Which of the following would you expect to be a drawback to PCR techniques?
(a) PCR can be used with very small samples such as single sperm cells.
(b) PCR has the potential to create positive results from very low levels of contamination.
(c) PCR is very rapid; in some cases results can be available in a few hours.
(d) All of these.

82. Which among the following is a pumping system in HPLC?
(a) reciprocating piston
(b) pneumatic amplifier
(c) syringe pumps
(d) all the above

83. Cot curve can be used to determine _____.
(a) the total concentration of DNA in a cell
(b) the sequence complexity of a given organism
(c) the number of origins of replication
(d) the length of the chromosome in basepairs

84. Name the instrument used to place the eppendorf tubes in PCR process?
(a) spectrophotometer
(b) DNA termal cycler
(c) FISH
(d) all the above

85. Southwestern blot mapping" is performed for rapid characterization of?
(a) specific sites on genomic DNA
(b) DNA-binding proteins
(c) both
(d) sequencing of DNA

86. Which of the following is a Safety measures for preventing PCR contamination?
(a) Use of filtered pipette tips
(b) The use of uracil-N-glycosylase (UNG)
(c) Ultraviolet irradiation
(d) all the above

87. Which of the following methods may be used for serological diagnosis?
(a) Single Radial Haemolysis (SRH)

(b) Complement-fixation tests (CFT)
(c) Western blot
(d) all the above

88. Primer strands required for the polymerization reaction in PCR are supplied as?
(a) ssDNA
(b) ssRNA
(c) dsRNA
(d) dsDNA

89. in the first gene cloning experiment?
(a) Researchers successfully inserted a gene for kanamycin resistance into a plasmid vector.
(b) Researchers successfully identified a human gene responsible for disease.
(c) Researchers demonstrated that many different DNA fragments could insert into a plasmid vector.
(d) Researchers produced a strain of bacteriophage with increased ability to infect E. coli.

90. The technique that utilizes probes to detect specific DNA sequences is known as?
(a) Northern blot
(b) Southern blot
(c) Western blot
(d) Eastern blot

91. Which of the following would NOT be an advantage to using DNA sequencing rather than restriction mapping?
(a) Restriction mapping is limited to identification of restriction sites that are relatively few in number.
(b) DNA sequencing allows the identification of all known restriction enzyme recognition sites in one experiment.
(c) Restriction sites that are very close together are difficult to restriction map.
(d) none of the above

92. The precipitate from the process is dissolved in buffer, pH=7.0. The high salt concentration is removed by passing the solution through a gel filtration column. The protein is expected to:
(a) elute before the residual salt.
(b) elute from the column after the residual salt.
(c) stick to the column.
(d) remain at the top of the column.

93. Which of the following is a sailent feature of detectors used in HPLC?
(a) they are polar
(b) they are non destructive
(c) they are large in size
(d) all the above

94. Which technique is most likely to be used by a molecular geneticist?
(a) Establishing crosses between genetic variants.
(b) Production of a new mutant allele of an interesting gene.
(c) Analysis of the amount of genetic variation in a population of individuals.
(d) Identification of a previously unknown species.

95. Which qualities should a good pumping system have in HPLC?
(a) a constant volume delivery
(b) a pulseless stable flow
(c) adaptable to gradient operation
(d) all the above

96. Genetic engineering has modified _____ for the creation of mono-unsaturated fatty acids.
(a) QTL polymerase
(b) PCR denaturase
(c) QLR esterase
(d) ACP desaturase

97. Which of the following is the detector used in HPLC?
(a) guard column
(b) UV/VIS Photometers
(c) IR/IVS detectors
(d) all the above

98. A molecular technique in which the DNA sequences between two oligonucleotide primers can be amplified by?
(a) Northern blotting
(b) Southern blotting
(c) Polymerase Chain Reaction
(d) all the above

99. Which of the following is an application of gel filtration?
(a) to separate all kinds of proteins

(b) to remove the low molecular weight contaminants
(c) to study the binding of proteins with ligands
(d) all the above

100. Which of the following are examples of viral genome detection (molecular methods) methods?
(a) Branched DNA
(b) Southern blot
(c) Polymerase chain reaction (PCR)
(d) all the above