1. Genetic structure of genome/DNA is studied through
    a. Genome colinearity
    b. Whole genome sequencing
    c. Maps both genetic & physical
    d. All of the above

2. Crucially important software systems have been developed for analysing primary sequence data and for carrying out DNA sequence assembly
    a. Consed
    b. Blast
    c. Phred
    d. Phrap
    e. a, c & d

3. A maintainer line is ----------
    a. Male fertile and can restore fertility
    b. Male sterile but can restore fertility
    c. **Male fertile but cannot restore fertility**
    d. Male sterile but cannot restore fertility
    e. None of the above

4. Prolonged inbreeding can lead to ----------
    a. Increased fertility
    b. **Reduced fertility**
    c. Increased sterility
    d. Reduced sterility
    e. None of these

5. The technique for cellular expression of genes is
    a. RT-PCR
    b. Northern blotting
    c. In situ hybridization
    d. DD-PCR

6. --------- is the techniques for gene expression at genome level
    a. RT-PCR
    b. Northern blotting
    c. In situ hybridization
    d. Microarray

7. Protein-protein interaction studies involved all the techniques except
    a. Bimolecular fluorescence complementation
    b. Yeast two hybrid
    c. Flow cytometry

d. YFP Split

8. In crop improvement programme, haploids are important because they
    a. require one half of nutrients
    b. are helpful in study of meiosis
    c. grow better under adverse conditions
    d. **form perfect homozygous**
    e. All of these

9. -------- is the technique for DNA protein interactions
    a. Yeast two Hybrid Assay
    b. Chromatin immune-precipitation assay (ChIP)
    c. Split-YFP analysis
    d. Genome walking

10. Callus is
    a. Tissue that forms embryo
    b. an insoluble carbohydrate
    c. **Unorganised actively dividing mass of cells maintained in culture**
    d. Tissue that growth to form embryoid

11. DNA is associated with highly basic protein called:
    a. **Histones**
    b. Non-histones
    c. Albumins
    d. Non-albumin

12. Formation of mRNA from DNA is called
    a. Transformation
    b. Transduction
    c. Translation
    d. **Transcription**

13. Breeding crops for improved nutritional quality is referred to as
    a. Bio-mining
    b. Bio-magnification
    c. **Bio-fortification**
    d. Bio-remediation
    e. None of these

14. EcoRI is an
    a. Ligase
    b. Polymerase
    c. **Restriction enzyme**

d. Gyrase

15. Bt Cotton is
    a. Cloned plant
    b. **Transgenic plant**
    c. Hybrid plant
    d. Mutated plant

16. Which of the following is a stop codon
    a. **UAA**
    b. UCC
    c. GCC
    d. CAT

17. An example of a heterozygous but homogenous population is
    a. Pure line
    b. **Hybrid variety**
    c. Synthetic variety
    d. Open pollinated variety
    e. None of these

18. Genome editing include all except
    a. CRISPR/Cas9
    b. Tallens
    c. Meganuclases
    d. Apoptosis

19. ---------- is the not the component of CRISPR/Cas system
    a. PAM
    b. crRNA
    c. sgRNA
    d. mRNA
    e. Cas protein

20. ----------is the property of Genome editing
    a. Random integration of foreign DNA
    b. Large sized DNA/genes are difficult to manipulate
    c. suitable for gene targeting or precise gene function
    d. Difficult to perform gene replacement or create allelic variations
    e. Introduction of undesirable DNA fragments (T-DNA, Selection markers)
    f. Extensive regulatory requirements

21. Genetically most pure seed is ----------
    a. Foundation seed

b. Certified seed
c. Breeder seed
d. **Nucleus seed**
e. All of the above

22. ----------is the most cultivated transgenic crop globally
a. Canola
b. Sugarcane
c. Soybean
d. Maize

23. ---------- is the most extensive trait present in transgenic crops globally.
a. Drought tolerance
b. Herbicide resistance
c. Disease resistance
d. Chilling resistance

24. Insecticides generally attack ----------
a. **Respiratory system**
b. Nervous system
c. Muscular system
d. Circulatory system
e. None of these

25. ---------- is not the application of Next Generation Sequencing
a. Exome sequencing
b. RNA-Seq
c. ChIP-Seq
d. RefSeq

26. The most commonly used genome browser is -------
a. NCBI
b. Tremble
c. Ensemble
d. Brad
e. DDJB

27. Artificial seeds are ----------
a. Seeds produced in laboratory condition
b. Seeds encapsulated in a gel
c. **Somatic embryos encapsulated in a gel**
d. Zygotic embryos encapsulated in a gel
e. All of the above

28. Extension for protein structural file is----------

a. ppt
b. meg
c. pdb
d. py
e. aln

29. Multiple sequence alignment algorithms generated with tools----------

a. ClustalW
b. Muscle
c. Geneious
d. NEXUS
e. both a & b
f. both b & d

30. A character determined by many genes and does not show discrete variation is known as

a. Multiple-allelic character
b. Oligogenic character
c. Quantitative character
d. **Qualitative character**
e. None of these

31. BT Cotton is ----

a. Insect resistant
b. Heat tolerant
c. Drought tolerant
d. Disease resistant
e. None of the above
f. All of the above
g.

32. Genomics is the study of------

a. a few genes
b. chloroplast genome
c. nuclear genome
d. chromosomes
e. b & c
f. c &d
g. all of above

33. A head or capitulum is characteristic of

a. **Compositeae**

b. Umbelliferae
c. Gramineae
d. Solanaceae
e. None of these

34. Some seeds enter dormancy when exposed to unfavourable condition for some time. Such dormancy is
    a. Primary dormancy
    b. Immediate dormancy
    c. Short term dormancy
    d. **Secondary dormancy**
    e. All of the above

35. The genetic code is described as degenerate. This means that.
    a. there are different aminoacyle-tRNAs each of which can recognize a unique codon.
    b. the amino acid carried by tRNA is determined by nucleotide sequence of the codon.
    c. **some amino acids are specified by more than one codon.**
    d. all codons specify one amino acid.

36. Which of the following statements are true regarding Southern hybridization?
    a. Developed by E.M Southern
    b. DNA-DNA hybridization is basis
    c. Transfer of DNA fragments from agarose gel to nitrocellulose membrane
    d. **All of the above**

37. For protein detection, most commonly used probe is
    a. Antigen
    b. Interferon
    c. antibody
    d. **Both a and c.**

38. Copy number of genes can be determined by
    a. Southern blotting
    b. Western blotting
    c. **PCR**
    d. All of the above

39. If a mutation occurs in an intergenic region it will be_____
    a. **silent**
    b. lethal
    c. no visible effect on cell
    d. both a and c

40. The particular array of chromosomes that individual possess is called its_____

    a. genotype
    b. **karyotype**
    c. phenotype
    d. all of the above

41. On a growing DNA strand replication always proceed on _____

    a. 3'-5' direction
    b. **5'-3' direction**
    c. medially
    d. non- directionally

42. The site of protein synthesis in the cell is_____

    a. Golgi complex
    b. **endoplasmic reticulum**
    c. ribosomes
    d. nucleus

43. A sequence reading GAATTC is recognized by the restriction enzyme _____

    a. **EcoR1**
    b. EcoR2
    c. EcoR3
    d. none of the above

44. Recombinant DNA technology is used to produce bacteria that reproduce in large vats called _____

    a. thermocyler
    b. **bioreactor**
    c. variants
    d. both b and c

45. In order to insert a gene into a cell in vivo gene therapy, the fatty acid vesicles used are known as _____

    a. Vectors
    b. **liposomes**
    c. lysosomes
    d. animal vector

46. Which of these is a true statement?

a. both plasmids and viruses can serve as vector
b. **plasmids can carry recombinant DNA but viruses can not**
c. vectors carry only the foreign genes into the cells
d. both a and b are correct

47. All of the following are sources of genetic variation for evolution, except:
a. mutation
b. recombination
c. **genetic drift**
d. gene flow

48. What is added to the 3'-end of many eukaryotic mRNAs after transcription?
a. introns
b. **a poly A tail**
c. a cap structure, consisting of a modified g nucleotide
d. the trinucleotide 5'-CCA

49. The primary RNA transcript of the chicken ovalbumin gene is 7700 nucleotides long, but the mature mRNA that is translated on the ribosome is 1872 nucleotides long. This size difference occurs primarily as a result of:
a. capping
b. cleavage of polycistronic mRNA
c. removal of poly a tails
d. reverse transcription
e. **splicing**

50. Promoters for eukaryotic mRNA synthesis:
a. are more complex than prokaryotic promoters
b. can require binding of multiple transcription factors to form a transcription complex
c. have specific DNA sequences such as the "TATA" box that are recognized by proteins
d. are the stretches of DNA to which RNA polymerase binds to initiate transcription
e. **all of these**

51. The regions of DNA in a eukaryotic gene that encode a polypeptide product are called:
a. hnRNAs
b. **exons**
c. enhancers
d. leader sequences
e. tRNAs

52. Which of the following molecules functions to transfer information from the nucleus to the cytoplasm?
    a. DNA
    b. **mRNA**
    c. tRNA
    d. proteins
    e. lipids

53. For the DNA strand 5'-tacgatcatat-3' the correct complementary DNA strand is:
    a. 3'-tacgatcatat-5'
    b. **3'-atgctagtata-5'**
    c. 3'-augcuaguaua-5'
    d. 3'-gcatatacgcg-5'
    e. 3'-tatactagcat-5'

54. A messenger acid is 336 nucleotides long, including the initiator and termination codons. the number of amino acids in the protein translated from this mRNA is:
    a. 999
    b. 630
    c. 330
    d. **111**
    e. 110

55. Which of the following tools of recombinant DNA technology is incorrectly paired with one of its uses?
    a. restriction endonuclease - production of DNA fragments for gene cloning.
    b. **DNA ligase - enzyme that cuts DNA, creating sticky ends.**
    c. DNA polymerase - copies DNA sequences in the polymerase chain reaction
    d. reverse transcriptase - production of cDNA from mRNA.
    e. electrophoresis - RLFP analysis.

56. Which of the following is not part of the normal process of cloning recombinant DNA in bacteria?
    a. restriction endonuclease digestion of cellular and plasmid DNAs.
    b. production of recombinant DNA using DNA ligase and a mixture of digested cellular and plasmid DNAs.
    c. separation of recombinant DNAs by electrophoresis using the southern technique to determine where the desired recombinant migrates.
    d. transformation of bacteria by the recombinant DNA plasmids and selection using ampicillin .
    e. **probing blots of bacteria clones with radioactive DNA complementary to the desired gene.**

57. Restriction endonuclease generated DNA fragments separated by gel electrophoresis and blot transferred onto a membrane filter are probed with a radioactive DNA fragment. This procedure is called:
    a. gene cloning
    b. **the Southern technique**
    c. the polymerase chain reaction
    d. recombinant DNA
    e. gene mapping

58. One of the most significant discoveries which allowed the development of recombinant DNA technology was:
    a. the discovery of antibiotics used for selecting transformed bacteria.
    b. **the identification and isolation of restriction endonucleases permitting specific DNA cutting.**
    c. the discovery of DNA and RNA polymerase allowing workers to synthesize any DNA sequence.
    d. the development of the polymerase chain reaction.
    e. the southern technique for separation and identification of DNA sequences.

59. Recombinant DNA technology depends on _____ steps.
    a. 3
    b. **4**
    c. 5
    d. 8
    e. 2

60. Arabidopsis genome was sequenced in _____.
    a. **2000**
    b. 1980
    c. 1994
    d. 1991
    e. 2008

61. Transposons are also called :
    a. jumping genes
    b. mobile DNA
    c. junk DNA
    d. selfish DNA
    e. **All of the above**

62. Which of the following are important features for transcription?
    a. Promoter
    b. RNA polymerase

c. 5′ and 3′ UTRs
d. ORF
e. **all of the above**

63. _____ is a test tube method to create and clone various of varieties of novel plants.
a. cloning
b. genetic engineering
c. gene therapy
d. **tissue culture**
e. none of these

64. Polyploidy refers to:
a. Extra copies of a gene adjacent to each other on a chromosome
b. **an individual with complete extra sets of chromosomes**
c. a chromosome which has replicated but not divided
d. multiple ribosomes present on a single mRNA
e. an inversion which does not include the centromere

65. Arabidopsis is advantageous for plant genetic research because:
a. it is commercially important as a food crop
b. it is an endangered species
c. it is the closest to humans of any existing plant
d. **it is a small plant with a small genome size which can be raised inexpensively**

66. Large quantities of useful products can be produced through genetic engineering involving:
a. bacteria containing recombinant plasmids
b. yeast carrying foreign genes
c. transgenic plants
d. mammals producing substances in their milk
e. **all of the above**

67. QTL analysis is used to:
a. identify RNA polymerase binding sites
b. map genes in bacterial viruses
c. determine which genes are expressed at a developmental stage
d. **identify chromosome regions associated with a complex trait in a genetic cross**
e. determine the most rapidly-evolving parts of genes

68. Golden rice contains _____

a. **vitamin A**
b. folic acid
c. vitamin D
d. lysine
e. both a and c

69. The first amino acid in bacterial proteins is

a. met.
b. fgly.
c. **fmet.**
d. gly.
e. none of the above.

70. What is the advantage of adding SDS to gel electrophoresis?
a. SDS colors the proteins for visualization.
b. **SDS reduces disulfide bonds**.
c. SDS allows proteins to be separated on the basis of approximate mass.
d. none of the above.
e. all of the above.

71. Which individual won a nobel prize for his landmark work in transposons?
a. Pauling
b. **Mcclintock**
c. Gilbert
d. Maxam
e. Sanger

72. Genes can be inserted into eukaryotic cells by
a. viruses.
b. chemical treatment
c. microinjection
d. **all of the above.**
e. none of the above

73. Reverse transcriptase is normally found in
a. Plants.
b. **retrovirus**
c. mitochondria.
d. E.Coli

e. both b and d

74. Ribosomes are composed of
    a. DNA.
    b. rRNA.
    c. protein.
    d. all of the above.
    e. **b and c.**

75. A technique that can be used to study protein location in cells.
    a. NMR spectroscopy
    b. **fluorescent microscopy**
    c. X-ray crystallography
    d. western blotting
    e. ion-exchange chromatography

76. Which of the following is not commonly used as vector?
    a. artificial chromosome
    b. cosmid
    c. **fungi**
    d. YAC
    e. Plasmid

77. 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 vector that confer some resistance to the host
    e. a RNA molecule

78. How are RFLPs detected?
    a. by looking at the chromosome in the microscope
    b. by doing a standard Mendelian cross
    c. by observing DNA of different lengths on a gel
    d. by seeing with which plasmids they will combine
    e. by amplifying the DNA using PCR

79. The first step in the replication of DNA is catalyzed by _____.
    a. helicase
    b. DNA polymerase
    c. ligase
    d. primase
    e. single-strand binding protein

80. Variations observed during tissue culture of some plants are known as
    a. clonal variations
    b. somatic variations
    c. somaclonal variations
    d. tissue culture variations

81. Virus free plants can be obtained through
    a. anitibiotic treatment
    b. pollen culture
    c. root tip culture
    d. shoot tip culture

82. To raising of plants from a small tissue in culture is known as
    a. macroproduction
    b. micropropagation
    c. tissue culture
    d. mass production

83. Haploid plant cultures are got from
    a. leaves
    b. root tip
    c. pollen grain
    d. buds

84. Which of the following cloning vectors is designed to accommodate the largest size DNA insert?
    a. plasmid
    b. phage
    c. cosmid
    d. YAC

85. A cDNA library contains clones representing which of the following?
    a. mRNA
    b. Genomic DNA
    c. introns
    d. repeated DNA sequences

86. Which enzyme is responsible for removing supercoils produced by unwinding of Replication fork
    a. DNA Polymerase
    b. Ligase

c. Primase
d. Topoisomerase

87. Initiation codon for translation is:
a. AGG
b. AUG
c. AGU
d. GAU

88. which is an alternative form of gene.
a. Allele
b. Operon
c. Split gene
d. Pseudogene

89. In a microbial culture the order of various phases is :
a. Log, Lag, Stationary, Death
b. Stationary, Log, Lag, Death
c. Lag, Log, Stationary, Death
d. Death, Log, Lag, Stationar

90. _____ is not an amino acid.
a. Histidine
b. Aspartic acid
c. Alanine
d. Oleic acid.

91. Crown gall disease in plants is caused by :
a. Agrobacterium niger
b. Agrobacterium faciens
c. Agrobacterium tumifaciens
d. Agrobacterium plantum

92. The conversion of CO2 and H2O into organic compounds using energy from light is called :
a. Photorespiration
b. Fermentation
c. Glycolysis
d. Photosynthesis

93. Full form of BLAST is

a. Broad Local Alignment Search Tool

b. Basic Local Alignment Search Tool
c. Basic Local Alignment Scanning Tool
d. Broad Local Alignment Scanning Tool

94. Class of hormone used for shoot elongation in tissue culture is

a. Auxins
b. Cytokinins
c. Gibberellins
d. None of these

95. Which of the following is required for DNA amplification?

a. Deoxyribonucleoside tri phasphates
b. Primers.
c. Thermostable DNA polymerase.
d. All the above.

96. Purine bases in the DNA are

a. **Adenine and Guanine**
b. Adenine and Cytosine
c. Cytosine and Thymine
d. Adenine and Thymine

97. When the performance of hybrid is over value of better parent, it is called

a. heterosis
b. heterobeltosis
c. additive gene action
d. Multiple gene action

98. Marker assisted foreground selection is practiced to select for

a. background of donor parent
b. background of recurrent parent
c. desirable gene from donor parent
d. desirable gene from recurrent parent

99. RIL mapping populations possess
a. additive variance
b. dominance variance
c. epistatic variance
d. both a and b

100. QTL mapping is based on

a. pleiotropy
b. linkage
c. segregation
d. independent assortment