**Fundamentals of Plant Biotechnology (ASPB 2201)**

|  |  |  |  |
| --- | --- | --- | --- |
| S. NO | MCQ | Instructions (Choose the correct answer) |  |
|  |  |  Critical factor that needs to be taken care of in PCR: |  |
| a) | Primer concentration |  |
| b) | Annealing temperature |  |
| c) | Prevention of primer dimerization |  |
| d) | All the above | YES |
|  |  | **Technique employed for the detection of Covid 19:** |  |
| a) | RT PCR | YES |
| b) | Asymmetric PCR |  |
| c) | Anchored PCR |  |
| d) | Microarray |  |
|  |   | W Double digest involves digestion by: |  |
| a) | III Two restriction enzymes | YES |
| b) | One rare cutter and a frequent cutter |  |
| c) | Two frequent cutters |  |
| d) | Two rare cutters |  |
|  |  |  Callus is: |  |
| a) |  differentiated non-dividing mass of cells |  |
| b) |  differentiated actively dividing mass of cells |   |
| c) |  Undifferentiated non-dividing mass of cells |  |
| d) |  Undifferentiated actively dividing mass of cells | YES |
|  |  | Sterilization method used to sterilize media, glasswares and accessory equipments: |  |
| a) | Moist heat sterilization | YES |
| b) | Dry heat sterilization |  |
| c) | Filter sterilization |   |
| d) | UV mediated sterilization |  |
|  |  | A nucleic acid probe is used to: |  |
| a) | Insert genes into a host cell |  |
| b) | Make DNA for gene cloning |  |
| c) | Find a nucleotide sequence | YES |
| d) | Cut pieces of DNA down to manageable size |  |
|  |  | In agarose gel electrophoresis: |  |
| a) | DNA migrates towards the negative electrode |  |
| b) | Supercoiled plasmid migrates slower than their nicked counterparts |  |
| c) | Larger molecules migrate faster than smaller molecules |  |
| d) | EtBr is used to visualize the DNA | YES |
|  |  | Ff The substrate for restriction enzyme is: |  |
| a) | G ss RNA |  |
| b) | partially ds RNA |   |
| c) |  cell wall proteins |  |
| d) |  ds DNA | YES |
| 9. |   | W Enzymes widely employed in PCR: |  |
| a) | IIIInvertases |  |  |
| b) | Lyases |  |  |
| c) | Ligases |  |  |
| d) | Polymerases | YES |  |
| 10. |  | **A widely used surface disinfectant:** |  |  |
|  | a) | Ethanol | YES |  |
|  | b) | SDS |  |  |
|  | c) | Phenol |  |  |
|  | d) | Chloroform |  |  |
| 11. |  | Cryopreservation involves preservation in  |  |  |
|  | a) | Formalin |  |  |
|  | b) | Glycerol |  |  |
|  | c) | Ethanol |  |  |
|  | d) | Liquid nitrogen at -196⁰C | YES |  |
| 12. |  | An O.D. value of 2.2 indicates |  |  |
|  | a) | Contamination of proteins |  |  |
|  | b) | Contamination of RNA | YES |  |
|  | c)  | Contamination of cellular debris |  |  |
|  | d) | Pure DNA |  |  |
| 13. |  | Widely employed restriction enzymes in gene cloning: |  |  |
|  | a) | Type II & Type III |  |  |
|  | b) | Type IV |  |  |
|  | c) | Type I |  |  |
|  | d) | Type II | YES |  |
| 14. |  | Periodic subculturing is required to prevent: |  |  |
|  | a) | the blackening of media |  |  |
|  | b) | fungal infestation |  |  |
|  | c) | limiting nutrient stress |  |  |
|  | d) | All the above | YES |  |
| 15. |  | W Which among the following is true about Auxins and cytokinins: |  |  |
|  | a) | G serve as growth regulators |  |  |
|  | b) | should be added in definite proportions |  |  |
|  | c) |  Initiate the formation of roots and shoots |  |  |
|  | d) | All the above | YES |  |
|   |   |   |  |  |
| 16. |  |  A plasmid is: |  |  |
| a) | Covalently closed circular DNA |  |  |
| b) | Found in bacteria & Yeast |  |  |
| c) | Widely employed gene cloning vehicle |  |  |
| d) | All of the above | YES |  |
| 17. |  | **Ti plasmid contains:** |  |  |
| a) | T DNA | YES |  |
| b) | r DNA |  |  |
| c) | mt DNA |  |  |
| d) | cp DNA |  |  |
| 18. |   | W Enzymes widely employed in PCR: |  |  |
| a) | IIIInvertases |  |  |
| b) | Lyases |  |  |
| c) | Ligases |  |  |
| d) | Polymerases | YES |  |
| 19. |  | Widely employed restriction enzymes in recombinant DNA technology: |  |  |
| a) | Type II & Type III |  |  |
| b) | Type IV |  |  |
| c) | Type I |  |  |
| d) | Type II | YES |  |
| 20. |  | An important feature that needs to be possessed by a molecular marker is: |  |  |
| a) | Co-dominant inheritance |  |  |
| b) | Polymorphism |  |  |
| c) | Even distribution |  |  |
| d) | All the above | YES |  |
| 21. |  | Which is a non PCR based marker? |  |  |
| a) | RFLP | YES |  |
| b) | AFLP |  |  |
| c) | VNTRs |  |  |
| d) | SSR |  |  |
|  22. |  | Father of plant tissue culture: |  |  |
| a) | Haberlandt | YES |  |
| b) | Frederick Sanger |  |  |
| c) | Winogradsky |  |  |
| d) | S. Nathans |  |  |
| 23. |  | Ff Cryopreservation involves preservation in: |  |  |
| a) | G DMSO |  |  |
| b) | Glycerol |  |  |
| c) | Ethanol |  |  |
| d) | Liquid nitrogen at -196⁰C | YES |  |
| 24. |  |  Vector-less method of gene delivery is: |  |  |
| a) | Microinjection |  |  |
| b) | Particle bombardment |  |  |
| c) | Electroporation |  |  |
| d) | All the above | YES |  |
| 25. |  | Plasmid containing a cos site is: |  |  |
| a) | Cosmid | YES |  |
| b) | Phagemid |  |  |
| c) | BAC |  |  |
| d) | PAC |  |  |
| 26. |  | Callus is: |  |  |
| a) | differentiated non-dividing mass of cells |  |  |
| b) | differentiated actively dividing mass of cells |  |  |
| c) | Undifferentiated non-dividing mass of cells |  |  |
| d) | Undifferentiated actively dividing mass of cells | YES |  |
| 27. |  | **Genetically modified plants have been used for:** |  |  |
| a) | Bioremediation |  |  |
| b) | Antigen production |  |  |
| c) | Synthesis of cry toxins |  |  |
| d) | All the above | YES |  |
| 28. |  | A A multiple cloning site: |  |  |
| a) | Cc Contains many copies of a cloned gene |  |  |
| b) | Allows flexibility in the choice of restriction enzymes for cloning | YES |  |
| c) | Allows flexibility in the choice of organism for cloning |  |  |
| d) | Contains many copies of the same restriction enzyme site |  |  |
| 29. |  | The substrate for restriction enzyme is: |  |  |
| a) | ss RNA |  |  |
| b) | partially ds RNA |  |  |
| c) | cell wall proteins |  |  |
| d) | ds DNA | YES |  |
| 30. |  | Plant tissue culture is important to study the factors controlling: |  |  |
| a) | Growth and differentiation |  |  |
| b) | Mutation, aging and production of biopharmaceuticals |  |  |
| c) | Both (a) and (b) | YES |  |
| d) | None of these |  |  |

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|   |   |   |  |  |
| 31. |  |  A cryptic plasmid |  |  |
| a) | Confers no property on the host | YES |  |
| b) | Lost after a period of time |  |  |
| c) | Nondegradative |  |  |
| d) | None of the above |  |  |
|  32. |  | **Vector employed for c DNA cloning** |  |  |
| a) | YAC |  |  |
| b) | PAC |  |  |
| c) | Bacteriophage |  |  |
| d) | PBLUESCRIPT | YES |  |
|  33. |   | W Which of the following forms of genetic engineering is the most common form? |  |  |
| a) | IIIInsertion of a functional gene at an unspecified location in the host genome | YES |  |
| b) | Knocking out specific genes via engineered nuclease |  |  |
| c) | Gene targeting |  |  |
| d) | None of the above |  |  |
|  34. |  | Restriction enzymes widely employed in gene cloning |  |  |
| a) | Type II & Type III |  |  |
| b) | Type IV |  |  |
| c) | Type I |  |  |
| d) | Type II | YES |  |
| 35. |  | Sanger’s method of DNA sequencing makes use of |  |  |
| a) | Monoclonal antibodies |  |  |
| b) | Synthetic primers |  |  |
| c) | Dideoxynucleotides | YES |  |
| d) | Radiolabelled probes |  |  |
|  36. |  | Which of the following classes of proteins are produced with molecular farming? |  |  |
| a) | Parental therapeutics |  |  |
| b) | Industrial enzymes |  |  |
| c) | Antigens for edible vaccines |  |  |
| d) | All of the above | YES |  |
|  37. |  | Curing refers to: |  |  |
| a) | Purification of a vector |  |  |
| b) | Engineering a vector |  |  |
| c) | Loss of a plasmid from a bacterium due to the absence of a selection pressure | YES |  |
| d) | Addition of replication origins to vectors |  |  |
| 38. |  | Ff Genetic colonization refers to: |  |  |
| a) | G Gene interaction |  |  |
| b) | Production of opines in the host | YES |  |
| c) | Production of acetosyringone |  |  |
| d) | The mechanism of transfer of genes |  |  |
| 39. |  | Vector-less method of gene delivery that makes use of microprojectiles |  |  |
| a) | Microinjection |  |  |
| b) | Particle bombardment | YES |  |
| c) | Electroporation |  |  |
| d) | All the above |  |  |
| 40. |  | Hairy roots serve as a source of: |  |  |
| a) | Secondary metabolites | YES |  |
| b) | Opines |  |  |
| c) | Primary metabolites |  |  |
| d) | Both a and c |  |  |
| 41. |  | A non PCR based marker is: |  |  |
| a) | RAPD |  |  |
| b) | RFLP | YES |  |
| c) | VNTR |  |  |
| d) | SCAR |  |  |
|  42. |  | **A cloning vector consisting of cos site inserted in a plasmid which is used to clone DNA fragments of lambda phage is:** |  |  |
| a) | Phagemid |  |  |
| b) | Cosmid | YES |  |
| c) | Plasmid |  |  |
| d) | YAC |  |  |
| 43. |  | A A multiple cloning site |  |  |
| a) | Cc contains many copies of a cloned gene |  |  |
| b) | Allows flexibility in the choice of restriction enzymes for cloning | YES |  |
| c) | Allows flexibility in the choice of organism for cloning |  |  |
| d) | Contains many copies of the same restriction enzyme site |  |  |
| 44. |  | Most genetically modified plants are generated by |  |  |
| a) | Biolistic method |  |  |
| b) | *Agrobacterium* *tumefaciens* |  |  |
| c) | lentivirus |  |  |
| d) | Both (a) and (b) | YES |  |
| 45. |  | Testing on GMOs on food and feed is routinely done by: |  |  |
| a) | DNA microarrays |  |  |
| b) | q PCR |  |  |
| c) | Both (a) and (b) | YES |  |
| d) | None of these |  |  |
| 46. |  | Which among the following GM crops is not developed by Monsanto? |  |  |
| a) | Bollgard |  |  |
| b) | Golden rice | YES |  |
| c) | Triple-stack corn |  |  |
| d) | Bt crops |  |  |
| 47. |  | **Which of the following is an example of new generation marker system?** |  |  |
| a) | Sequence tagged sites |  |  |
| b) | Single nucleotide polymorphism |  |  |
| c) | Short Tandem Repeats |  |  |
| d) | All of the above | YES |  |
| 48. |  | W Which of the following statements regarding the findings of the human genome project is incorrect? |  |  |
| a) | GGenetic screening of families for inheritable diseases may become possible |  |  |
| b) | A large amount of the human genome contains DNA sequences that do not code for cell protein |  |  |
| c) | 97% of the human genome is made up of support DNA that functions in chromosome stabilizing and division, gene regulation and ribosome assembly |  |  |
| d) | Human chromosomes are capable of “walking” | YES |  |
|  49. |  | Why does the environmental protection agency closely monitor the release of transgenic bacteria used for agricultural purposes? |  |  |
| a) | They want to monitor the destruction of crops by the GMOs |  |  |
| b) | They want to observe the effect of GMOs on crops |  |  |
| c) | They want to ensure that GMOs do not proliferate in the environment and pose a threat to humans |  |  |
| d) | They want to ensure the people that GMOs have played a role in the production of a particular food product |  |  |
| 50. |  | Blue-white screening is used to: |  |  |
| a) | Reveal the identity of a cloned DNA fragment |  |  |
| b) | Express the product of a cloned gene |  |  |
| c) | Test the presence of a plasmid in bacteria |  |  |
| d) | Test for the presence of a cloned insert in a plasmid | YES |  |
| 51. |  | Which is a palindromic sequence? |  |  |
|  | a) | 5’-ACGGATTCGC-3’ |  |  |
|  | b) | 5’-ATG-3’ |  |  |
|  | c) | 5’-CCATT-3’ |  |  |
|  | d) | 5’-AGGCCT-3’ | YES |  |
| 52. |  | The first recombinant crop approved for sale in the U.S |  |  |
|  | a) | Flavr Savr tomato | YES |  |
|  | b) | Bt cotton |  |  |
|  | c) | Bt Brinjal |  |  |
|  | d) | Bt tobacco |  |  |

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| S. No. | TXT | Instructions (Fill in the Blanks) |  |  |
| 1 |  |  An important property of restriction endonucleases is : **site specificity** |  |  |
|  |  |  |  |
| 2 |  | DBT stands for: **department of biotechnology** |  |  |
|  |  |  |  |
| 3 |  | The ability by which plant cells can regenerate giving rise to the total plant: **totipotency** |  |  |
|  |  |  |  |
| 4 |  | Crown gall tumour is caused by: ***Agrobacterium* *tumefaciens*** |  |  |
|  |  |  |  |
| 5 |  | A cytoplasmic hybrid is: **cybrid** |  |  |
|  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No. | MATCH | Left side | Right side |  |
|   |  |  |  |  |
| 1 |  DNA fingerprinting | Forensic analysis |  |
| 2 | Polyethylene glycol | Fusogen |  |
| 3 | Auxins & cytokinins | Plant growth regulators |  |
| 4 | Protoplast | Cell without cell wall |  |
| 5 | NBPGR | Plant germplasm repository |  |

I. **Explain the following terms very briefly**:

a. Plasmid

b. Primer

c. Protoplast

d. Totipotency

e. Reverse transcription

II. **Expand the abbreviations**:

a. DBT, b. NBPGR, c. CDFD, d. NRRI, e. SSR

III. **Fill in the blanks**:

a. Blotting technique used for DNA is ……….. (Eastern, Southern)

b. Thermal cycler is a machine in which ………. Is carried out. (PCR, Blotting)

c. Cryopreservation involves the usage of ……… (liquid nitrogen at -196֯C, vapour nitrogen at -150֯C)

d. An example of a natural vector is …….. (Ti plasmid, PUC 8)

e. The process of development of structures like root, shoot, flower, buds etc .is called ……….. (differentiation, organogenesis)

f.A hormone that initiates rooting is …………………

 g. Widely employed media in plant tissue culture is ……….

 h.Father of biotechnology is …………

 i.Marker widely employed in biodiversity studies is ……….

 j.An example of a commonly used cytokinin is …………

 IV. **State whether the following statements are true or false**:

* A balanced ratio between auxin to cytokinin is required during the induction of callus.
* Hardening is not required for invitro raised plantlets.
* *Agrobacterium* is a potential bacterium used in agricultural biotechnology.
* Cybrids are cytoplasmic hybrids.
* The PH of media used in plant tissue culture should be maintained around 7.2-7.4.

**V. Match the following:**

* a. Callus (i) Site specificity
* b. RFLP (ii) Vectorless method of gene delivery
* c. NAA (iii) Isoschizomers
* d. Anther culture (iv) An unorganized mass of cells
* e. Particle bombardment (v) Root stabilizing media

 (vi) Haploid culture

(vii) Molecular marker

**VI. Short Answer Type Questions:**

* What role do growth regulators play in plant tissue culture media?
* Give a brief note on the scopes offered by plant tissue culture.
* What is cryopreservation? Give few examples of cryoprotectants.
* What is protoplast? Suggest two advantages associated with the use of protoplasts.
* Briefly explain the principle of autoclaving.
* What are restriction endonucleases?
* What factors necessisate the subculturing of the media?
* What are molecular markers? Throw light on the salient features to be possessed by markers.

VII. **Long Answer Type Questions**:

a. What are restriction endonucleases? Mention the source and the roles played by it in gene cloning.

b. What are molecular markers?. Describe the steps involved in the construction of RAPD marker.

c. What are transgenic plants? How do they serve as bioreactors?

d. What is somaclonal variation? Add a note on the factors contributing to it.

e. What is gene cloning? Briefly explain the steps invoved in it.

f. Describe the genetic organization of Ti plasmid.

g. What is DNA fingerprinting? Briefly explain the role of this technique in forensic investigation.

h. What is media? Explain briefly the composition of a tissue culture media studied by you.

i. What is somatic hybridisation? Suggest the advantages associated with the technique.

j. Briefly explain a vectorless method of gene delivery studied by you.

k. Suggest two methods available for the isolation of protoplasts.

l. What is micropropagation? Add a note on the stages associated with it.

m. Suggest two methods for the fusion of protoplasts?

n. Describe the general organization of a plant tissue culture laboratory and add a note on the factors that contribute to the invitro growth of plants.

o. What role do vectors play in gene cloning? Name few vectors that have been potentially employed in the area of agricultural biotechnology.