MCQ's on

Plant Biotechnology

Dr.J.Caroline Rose

Mrs.Margret Kanimozhi

1. Who is known as the "Father of Plant Tissue Culture"?
   a) Robert Hooke
   b) Gottlieb Haberlandt
   c) Gregor Mendel
   d) Anton van Leeuwenhoek
   Answer: b) Gottlieb Haberlandt

2. The term "tissue culture" was first introduced by:
   a) Gottlieb Haberlandt
   b) Wilhelm Pfeffer
   c) Ernest Everett Just
   d) Frederick Gowland Hopkins
   Answer: a) Gottlieb Haberlandt

3. Which of the following is not a historical milestone in plant tissue culture?
   a) Discovery of the nutrient medium
   b) Invention of the microscope
   c) Development of aseptic techniques
   d) Introduction of hormonal control
   Answer: b) Invention of the microscope

4. The first successful tissue culture experiment was conducted on:
   a) Tobacco
   b) Tomato
   c) Orchid
   d) Carrot
   Answer: d) Carrot

5. The technique of organogenesis involves the regeneration of:
   a) Roots
   b) Shoots
   c) Leaves
   d) Flowers

Answer: b) Shoots

6. Callus formation in tissue culture refers to the development of:

a) Roots

b) Shoots

c) Undifferentiated mass of cells

d) Flowers

Answer: c) Undifferentiated mass of cells

7. The process of somatic embryogenesis involves the development of embryos from:

a) Zygotic cells

b) Somatic cells

c) Gametic cells

d) Pollen grains

Answer: b) Somatic cells

8. Who discovered the role of auxins in controlling tissue differentiation?

a) Fritz Went

b) Julius von Sachs

c) Theodor Schwann

d) George Washington Carver

Answer: a) Fritz Went

9. The first plant successfully regenerated from single cells in tissue culture was a:

a) Potato

b) Maize

c) Rose

d) Tobacco

Answer: d) Tobacco

10. The development of haploid plants from anther or pollen culture was achieved by:

a) E. L. Tatum

b) John Gurdon

c) C. Mohan Ram

d) G. Ledyard Stebbins

Answer: c) C. Mohan Ram

11. Which plant hormone is commonly used for inducing rooting in tissue culture?

a) Auxin

b) Cytokinin

c) Gibberellin

d) Abscisic acid

Answer: a) Auxin

12. The preservation of plant cells or tissues at very low temperatures is known as:

a) Micropropagation

b) Cryopreservation

c) Grafting

d) Rhizogenesis

Answer: b) Cryopreservation

13. The International Association for Plant Tissue Culture and Biotechnology (IAPTC&B) was established in:

a) 1950

b) 1963

c) 1978

d) 1987

Answer: c) 1978

14. Plant tissue culture techniques find applications in all of the following except:

a) Micropropagation

b) Genetic modification

c) Horticulture

d) Animal breeding

Answer: d) Animal breeding

15. The primary aim of establishing aseptic conditions in plant tissue culture is to:

a) Prevent contamination

b) Enhance growth rates

c) Induce mutations

d) Reduce hormone concentrations

Answer: a) Prevent contamination

16. The discovery of totipotency in plant cells means that:

a) Cells can differentiate into multiple cell types

b) Cells can only produce a specific type of tissue

c) Cells lose their ability to divide

d) Cells cannot be cultured in vitro

Answer: a) Cells can differentiate into multiple cell types

17. Who pioneered the concept of micropropagation?

a) Michael Faraday

b) Ken-Ichiro Sueoka

c) Charles Darwin

d) George Templeton Strong

Answer: b) Ken-Ichiro Sueoka

18. The phenomenon where cells lose their differentiation potential and become dedifferentiated is known as:

a) Somatic embryogenesis

b) Callus induction

c) Dedifferentiation

d) Totipotency

Answer: c) Dedifferentiation

19. The use of plant tissue culture for germplasm conservation helps in:

a) Increasing genetic diversity

b) Reducing genetic variability

c) Speeding up evolution

d) Eliminating mutations

Answer: a) Increasing genetic diversity

20. Which of the following is not a commonly used explant for initiating tissue culture?

a) Leaf

b) Root

c) Stem

d) Fruit

Answer: d) Fruit

21. What is the primary purpose of maintaining a sterile environment in a plant tissue culture laboratory?

a) To enhance plant growth

b) To prevent contamination

c) To increase mutation rates

d) To facilitate genetic modification

Answer: b) To prevent contamination

22. Which area in a plant tissue culture laboratory is specifically designated for the initial processing and sterilization of plant materials?

a) Growth room

b) Media preparation room

c) Aseptic transfer chamber

d) Incubation chamber

Answer: c) Aseptic transfer chamber

23. The laminar flow hood in a tissue culture laboratory is used for:

a) Incubation of cultures

b) Preparation of media

c) Maintaining sterile conditions during work

d) Growth of plants

Answer: c) Maintaining sterile conditions during work

24. The temperature and humidity levels in a tissue culture laboratory are typically controlled to:

a) Accelerate growth rates

b) Minimize water usage

c) Reduce contamination risk

d) Enhance mutation frequency

Answer: c) Reduce contamination risk

25. What is the purpose of a growth room in a plant tissue culture laboratory?

a) Sterilization of equipment

b) Preparation of media

c) Long-term storage of cultures

d) Isolation of contaminated cultures

Answer: c) Long-term storage of cultures

26. The process of acclimatization in plant tissue culture refers to:

a) Adjustment of media pH

b) Gradual adaptation of plantlets to ex vitro conditions

c) Sterilization of explants

d) Inducing callus formation

Answer: b) Gradual adaptation of plantlets to ex vitro conditions

27. Which personnel in a tissue culture laboratory are primarily responsible for ensuring aseptic techniques are followed during procedures?

a) Biotechnologists

b) Lab assistants

c) Lab technicians

d) Lab managers

Answer: a) Biotechnologists

28. The purpose of subculturing in tissue culture is to:

a) Introduce genetic modifications

b) Enhance callus formation

c) Maintain healthy and actively growing cultures

d) Reduce contamination risk

Answer: c) Maintain healthy and actively growing cultures

29. What type of lighting is typically used in growth rooms for plant tissue culture?

a) Natural sunlight

b) Incandescent bulbs

c) Fluorescent or LED lights

d) High-intensity discharge lamps

Answer: c) Fluorescent or LED lights

30. What does the term "explant" refer to in plant tissue culture?

a) Sterile conditions

b) The medium used for growth

c) The material used to initiate cultures

d) Growth hormones applied to cultures

Answer: c) The material used to initiate cultures

31. In a tissue culture laboratory, autoclaving is primarily used for:

a) Maintaining temperature

b) Sterilizing equipment and media

c) Controlling humidity levels

d) Increasing mutation rates

Answer: b) Sterilizing equipment and media

32. Which part of the tissue culture laboratory is responsible for preparing nutrient media for plant cultures?

a) Growth room

b) Incubation chamber

c) Media preparation room

d) Aseptic transfer chamber

Answer: c) Media preparation room

33. The concept of "cross-contamination" in plant tissue culture refers to:

a) Introducing beneficial mutations

b) Transferring genetic material between species

c) Unintended contamination between cultures

d) Exposing cultures to high radiation

Answer: c) Unintended contamination between cultures

34. A tissue culture laboratory should be equipped with fire extinguishers primarily because:

a) High temperatures accelerate plant growth

b) To prevent contamination

c) Safety in case of fire emergencies

d) To enhance lighting conditions

Answer: c) Safety in case of fire emergencies

35. Which organization regulates safety protocols in laboratories handling genetically modified organisms (GMOs) in many countries?

a) International Atomic Energy Agency (IAEA)

b) Food and Drug Administration (FDA)

c) World Health Organization (WHO)

d) Biosafety level (BSL) standards

Answer: d) Biosafety level (BSL) standards

36. The purpose of using fungicides or antibiotics in tissue culture laboratories is to:

a) Promote faster growth

b) Stimulate flowering

c) Prevent bacterial or fungal contamination

d) Increase mutation rates

Answer: c) Prevent bacterial or fungal contamination

37. The disposal of used culture materials in a tissue culture laboratory should be done:

a) By washing and reusing them

b) Through recycling processes

c) Using autoclaving and then discarding as general waste

d) By incineration or appropriate sterilization followed by disposal

Answer: d) By incineration or appropriate sterilization followed by disposal

38. What is the purpose of using PPE (Personal Protective Equipment) in a tissue culture laboratory?

a) To enhance plant growth

b) To minimize contamination risk and protect personnel

c) To increase mutation frequency

d) To speed up culture initiation

Answer: b) To minimize contamination risk and protect personnel

39. Which of the following is not a common safety practice in a tissue culture laboratory?

a) Regularly cleaning work surfaces and equipment

b) Wearing appropriate PPE

c) Consuming food and drinks inside the laboratory

d) Proper disposal of waste materials

Answer: c) Consuming food and drinks inside the laboratory

40. In a tissue culture laboratory, what is the role of a standard operating procedure (SOP)?

a) To reduce humidity levels

b) To increase mutation rates

c) To standardize protocols and ensure consistency in practices

d) To control lighting conditions

Answer: c) To standardize protocols and ensure consistency in practices

41. Which of the following is a commonly used chemical sterilant in plant tissue culture?

a) Ethanol

b) Hydrogen peroxide

c) Vinegar

d) Salt solution

Answer: b) Hydrogen peroxide

42. Autoclaving is a sterilization technique that primarily utilizes:

a) Dry heat

b) High pressure and steam

c) Radiation

d) Chemicals

Answer: b) High pressure and steam

43. What is the optimal temperature and time combination typically used for autoclaving in plant tissue culture?

a) 100°C for 15 minutes

b) 121°C for 15 minutes

c) 150°C for 30 minutes

d) 200°C for 60 minutes

Answer: b) 121°C for 15 minutes

44. Which of the following is an effective method for sterilizing glassware in tissue culture laboratories?

a) Dry heat

b) UV radiation

c) Autoclaving

d) Ethanol treatment

Answer: c) Autoclaving

45. What is the purpose of flaming tools or instruments in a tissue culture laboratory?

a) To enhance growth rates

b) To reduce contamination by killing microbes

c) To improve lighting conditions

d) To increase mutation rates

Answer: b) To reduce contamination by killing microbes

46. Which of the following is a limitation of using dry heat for sterilization in tissue culture?

a) Requires high temperatures

b) Long exposure times

c) Ineffective for some materials

d) All of the above

Answer: d) All of the above

47. What does a laminar flow hood primarily help to achieve in a tissue culture laboratory?

a) Cooling of the working area

b) Sterilization of tools

c) Reduction of airborne contamination

d) Increasing humidity levels

Answer: c) Reduction of airborne contamination

48. How does filtration help in sterilizing liquids or nutrient media in plant tissue culture?

a) Using UV light

b) Removing solid particles

c) Increasing temperature

d) Applying high pressure

Answer: b) Removing solid particles

49. The use of UV radiation for sterilization primarily targets:

a) Bacteria and viruses

b) Fungi and spores

c) Plant cells

d) Insects and pests

Answer: a) Bacteria and viruses

50. What is the purpose of using aseptic transfer techniques in tissue culture?

a) To speed up plant growth

b) To minimize contamination during transfers

c) To increase mutation rates

d) To induce callus formation

Answer: b) To minimize contamination during transfers

51. Which of the following is a disadvantage of using UV radiation for sterilization?

a) Slow sterilization process

b) Inability to penetrate through materials

c) High cost

d) Generation of toxic residues

Answer: b) Inability to penetrate through materials

52. What is the role of chemical sterilization agents like ethanol or bleach in tissue culture?

a) Increase mutation rates

b) Speed up growth rates

c) Kill surface microorganisms

d) Reduce pH of media

Answer: c) Kill surface microorganisms

53. Which of the following is an appropriate method to sterilize a scalpel or forceps during tissue culture work?

a) Submerging in water

b) Flaming over a Bunsen burner

c) Wiping with a dry cloth

d) Spraying with ethanol

Answer: b) Flaming over a Bunsen burner

54. The use of ethylene oxide gas for sterilization is suitable for:

a) Heat-resistant materials

b) Liquids and nutrient media

c) Plastic and rubber materials

d) Glassware and metal instruments

Answer: c) Plastic and rubber materials

55. Which of the following is a limitation of using ethylene oxide gas for sterilization?

a) Slow penetration through materials

b) High cost

c) Generation of toxic residues

d) Inability to kill spores

Answer: a) Slow penetration through materials

56. What is the purpose of pre-sterilizing containers before autoclaving media in tissue culture?

a) To prevent contamination during storage

b) To reduce the duration of autoclaving

c) To maintain the pH of the media

d) To facilitate growth of cultures

Answer: b) To reduce the duration of autoclaving

57. Which of the following is a common step before autoclaving solid nutrient media in tissue culture?

a) Adding growth hormones

b) Sealing containers tightly

c) Adjusting the pH

d) Exposing to UV radiation

Answer: c) Adjusting the pH

58. The use of filtration sterilization is effective for:

a) Removing gases from media

b) Sterilizing liquids without heat

c) Eliminating solid particles only

d) Heat-sensitive materials

Answer: d) Heat-sensitive materials

59. What precaution should be taken while using bleach for sterilization in tissue culture?

a) Diluting it with water before use

b) Exposing it to direct sunlight

c) Using it at high temperatures

d) Avoiding contact with skin and eyes

Answer: d) Avoiding contact with skin and eyes

60. Why is it important to allow autoclaved materials to cool before handling them?

a) To prevent condensation

b) To avoid burns

c) To reduce contamination risk

d) To improve growth rates

Answer: b) To avoid burns

61. The use of microwaves for sterilization is effective for:

a) Killing spores and bacteria

b) Sterilizing glassware

c) Rapidly sterilizing liquids

d) Increasing mutation rates

Answer: c) Rapidly sterilizing liquids

62. Which of the following is an advantage of using laminar flow hoods for sterilization in tissue culture?

a) High temperatures for rapid sterilization

b) Low cost and ease of use

c) Reduction of airborne contamination

d) Applicability for heat-sensitive materials

Answer: c) Reduction of airborne contamination

63. The purpose of using a biological indicator during sterilization processes is to:

a) Monitor temperature fluctuations

b) Detect the presence of microorganisms

c) Adjust humidity levels

d) Regulate pressure conditions

Answer: b) Detect the presence of microorganisms

64. What is the role of maintaining proper ventilation in a tissue culture laboratory during sterilization processes?

a) Increase mutation rates

b) Minimize contamination

c) Enhance growth rates

d) Reduce the need for sterilization

Answer: b) Minimize contamination

65. When using ethylene oxide gas for sterilization, what is a critical safety consideration?

a) Exposure to direct sunlight

b) Proper disposal of used gas cartridges

c) Lowering the humidity levels

d) Using higher concentrations for faster sterilization

Answer: b) Proper disposal of used gas cartridges

66. What is the primary function of a plant tissue culture medium?

a) Providing support to plant tissue

b) Facilitating genetic modification

c) Providing nutrients and growth factors

d) Inducing callus formation

Answer: c) Providing nutrients and growth factors

67. Which of the following components is commonly found in a basal plant tissue culture medium?

a) Sucrose

b) Agar

c) Vitamins

d) Cytokinins

Answer: c) Vitamins

68. MS medium, widely used in plant tissue culture, stands for:

a) Magnesium and Sulphate

b) Murashige and Skoog

c) Macronutrients and Micronutrients

d) Mannitol and Sorbitol

Answer: b) Murashige and Skoog

69. Which type of plant tissue culture medium contains all the essential nutrients and growth factors required for the growth of plant cells or tissues?

a) Basal medium

b) Maintenance medium

c) Enriched medium

d) Selective medium

Answer: a) Basal medium

70. The primary gelling agent used in plant tissue culture media is:

a) Starch

b) Pectin

c) Agar

d) Cellulose

Answer: c) Agar

71. What is the purpose of adding sucrose to a plant tissue culture medium?

a) Provide structural support to cultures

b) Enhance coloration of the medium

c) Serve as a carbon source for energy

d) Regulate pH of the medium

Answer: c) Serve as a carbon source for energy

72. The main function of cytokinins in a tissue culture medium is to:

a) Induce root formation

b) Promote cell division and shoot growth

c) Initiate callus formation

d) Increase water uptake by cells

Answer: b) Promote cell division and shoot growth

73. A medium containing all the essential nutrients but lacking a particular component, such as a specific amino acid, is known as:

a) Basal medium

b) Complete medium

c) Enriched medium

d) Deficient medium

Answer: d) Deficient medium

74. Which of the following plant growth regulators is commonly found in plant tissue culture media to induce root formation?

a) Auxin

b) Gibberellin

c) Cytokinin

d) Ethylene

Answer: a) Auxin

75. A plant tissue culture medium that contains an extra amount of certain nutrients or growth regulators for specific purposes is called:

a) Basal medium

b) Complete medium

c) Enriched medium

d) Deficient medium

Answer: c) Enriched medium

76. The preparation of a plant tissue culture medium involves the use of distilled water primarily to:

a) Enhance nutrient absorption

b) Minimize contamination risk

c) Increase pH levels

d) Reduce costs

Answer: b) Minimize contamination risk

77. Which type of media is used to promote the growth of a specific type of cells or tissues while inhibiting the growth of others?

a) Basal medium

b) Complete medium

c) Enriched medium

d) Selective medium

Answer: d) Selective medium

78. What is the purpose of adjusting the pH of a plant tissue culture medium?

a) To control microbial growth

b) To enhance nutrient availability

c) To regulate osmotic pressure

d) All of the above

Answer: d) All of the above

79. The addition of activated charcoal to a plant tissue culture medium primarily aids in:

a) Enhancing growth rates

b) Providing carbon source

c) Absorbing toxins and impurities

d) Reducing pH levels

Answer: c) Absorbing toxins and impurities

80. Which of the following components is commonly used as a nitrogen source in plant tissue culture media?

a) Glucose

b) Peptone

c) Sodium chloride

d) Mannitol

Answer: b) Peptone

81. A hormone-free medium used for transferring cultures or for washing tissues is known as:

a) Basal medium

b) Maintenance medium

c) Subculture medium

d) Washing medium

Answer: d) Washing medium

82. What is the role of vitamins in plant tissue culture media?

a) Provide energy

b) Facilitate photosynthesis

c) Act as cofactors for enzyme activities

d) Increase water uptake

Answer: c) Act as cofactors for enzyme activities

83. A type of plant tissue culture medium used for the initiation of cultures from explants is called:

a) Basal medium

b) Shoot induction medium

c) Callus initiation medium

d) Initiation medium

Answer: d) Initiation medium

84. The PGR commonly used to induce callus formation in tissue culture is:

a) Gibberellic acid

b) Abscisic acid

c) Indole-3-acetic acid (IAA)

d) Zeatin

Answer: c) Indole-3-acetic acid (IAA)

85. The pH of a typical plant tissue culture medium is usually adjusted to:

a) Neutral (pH 7)

b) Acidic (pH 5-6)

c) Alkaline (pH 8-9)

d) Highly acidic (pH <5)

Answer: b) Acidic (pH 5-6)

86. The addition of plant growth regulators to a tissue culture medium is mainly to:

a) Increase shelf life

b) Enhance physical structure

c) Mimic natural hormonal conditions

d) Improve taste of cultures

Answer: c) Mimic natural hormonal conditions

87. What does a half-strength medium refer to in plant tissue culture?

a) Medium with half the nutrients

b) Medium diluted to half concentration

c) Medium with reduced agar content

d) Medium with added growth regulators

Answer: b) Medium diluted to half concentration

88. The use of coconut milk or banana extract in a plant tissue culture medium is primarily to provide:

a) Vitamins

b) Growth regulators

c) Minerals

d) Sugars

Answer: b) Growth regulators

89. Which of the following factors is crucial to consider while preparing a plant tissue culture medium?

a) Ambient light conditions

b) Humidity levels

c) Plant maturity

d) pH of the water source

Answer: d) pH of the water source

90. A media supplement that helps to enhance shoot elongation and prevent premature leaf senescence in tissue cultures is:

a) Casein hydrolysate

b) Coconut milk

c) L-glutamine

d) Potato extract

Answer: a) Casein hydrolysate

91. The presence of high levels of potassium nitrate (KNO3) in a tissue culture medium primarily assists in:

a) Shoot initiation

b) Root development

c) Callus formation

d) Improving leaf coloration

Answer: d) Improving leaf coloration

92. What is the primary purpose of using a growth regulator such as gibberellic acid in a tissue culture medium?

a) Induce flowering

b) Enhance shoot elongation

c) Increase callus formation

d) Promote root initiation

Answer: a) Induce flowering

93. Which of the following components is an example of a micronutrient in plant tissue culture media?

a) Potassium

b) Magnesium

c) Iron

d) Nitrogen

Answer: c) Iron

94. The primary role of BAP (6-Benzylaminopurine) in tissue culture media is to:

a) Induce root initiation

b) Promote shoot initiation

c) Enhance callus growth

d) Stimulate leaf expansion

Answer: b) Promote shoot initiation

95. A plant tissue culture medium without any growth regulators is often used for:

a) Micropropagation

b) Callus induction

c) Long-term storage

d) Embryo rescue

Answer: c) Long-term storage

96. The addition of malt extract to a tissue culture medium primarily provides:

a) Sugars

b) Vitamins

c) Growth regulators

d) Amino acids

Answer: a) Sugars

97. Which of the following components is typically used as a carbon source in plant tissue culture media?

a) Sodium chloride

b) Mannitol

c) Glucose

d) Potassium nitrate

Answer: c) Glucose

98. A hormone commonly used to induce root growth in tissue culture is:

a) Cytokinin

b) Gibberellic acid

c) Indole-3-butyric acid (IBA)

d) Abscisic acid

Answer: c) Indole-3-butyric acid (IBA)

99. The presence of activated charcoal in a tissue culture medium helps in:

a) Increasing pH levels

b) Reducing contamination

c) Enhancing shoot elongation

d) Stimulating callus formation

Answer: b) Reducing contamination

100. Which of the following is not a common basal medium used in plant tissue culture?

a) B5 medium

b) N6 medium

c) P6 medium

d) WPM medium

Answer: c) P6 medium

101. The hormone commonly used to break seed dormancy and promote germination in tissue culture is:

a) Auxin

b) Gibberellic acid

c) Cytokinin

d) Ethylene

Answer: b) Gibberellic acid

102. The addition of ascorbic acid to a tissue culture medium primarily serves as a:

a) pH buffer

b) Reducing agent

c) Source of nitrogen

d) Growth regulator

Answer: b) Reducing agent

103. What is the purpose of adding ammonium nitrate to a tissue culture medium?

a) Enhance shoot elongation

b) Promote callus formation

c) Act as a source of nitrogen

d) Increase mineral content

Answer: c) Act as a source of nitrogen

104. The hormone commonly used to promote bud break and induce shoot development in tissue culture is:

a) Abscisic acid

b) Gibberellic acid

c) Indole-3-acetic acid (IAA)

d) Cytokinin

Answer: b) Gibberellic acid

105. A type of tissue culture medium used for the multiplication of a large number of plants from small explants is termed as:

a) Multiplication medium

b) Elongation medium

c) Proliferation medium

d) Propagation medium

Answer: c) Proliferation medium

106. MS medium is commonly used in plant tissue culture due to its balanced composition of:

a) Macro- and micronutrients

b) Growth regulators only

c) Sugars and vitamins

d) Agar and sucrose

Answer: a) Macro- and micronutrients

107. The creators of the MS medium, Murashige and Skoog, developed it primarily for the culture of:

a) Monocots

b) Dicots

c) Gymnosperms

d) Bryophytes

Answer: b) Dicots

108. Which of the following plant growth regulators is usually added to MS medium to promote shoot proliferation?

a) Gibberellic acid (GA)

b) Cytokinin

c) Auxin

d) Abscisic acid (ABA)

Answer: b) Cytokinin

109. In MS medium, the proportion of macronutrients to micronutrients is approximately:

a) 1:1

b) 10:1

c) 100:1

d) 1000:1

Answer: c) 100:1

110. The MS medium is named after:

a) Its creators

b) The university where it was developed

c) Its main application in tissue culture

d) Its chemical components

Answer: a) Its creators

111. Nitsch medium is typically used for the culture of:

a) Orchids

b) Cacti

c) Carnations

d) Pines

Answer: a) Orchids

112. One of the distinguishing features of Nitsch medium is its:

a) High salt concentration

b) Low nitrogen content

c) Absence of vitamins

d) High sucrose concentration

Answer: b) Low nitrogen content

113. Nitsch medium is often employed in the culture of orchids due to its ability to:

a) Induce callus formation

b) Enhance root elongation

c) Promote flower initiation

d) Stimulate shoot proliferation

Answer: c) Promote flower initiation

114. Which of the following plant growth regulators is commonly added to Nitsch medium to encourage root development?

a) Cytokinin

b) Auxin

c) Gibberellic acid

d) Abscisic acid

Answer: b) Auxin

115. The pH range suitable for Nitsch medium is typically:

a) 4.0 - 5.0

b) 5.5 - 6.5

c) 6.0 - 7.0

d) 7.5 - 8.5

Answer: a) 4.0 - 5.0

:

116. Gamborg's B5 medium is commonly used for the culture of:

a) Wheat

b) Tomato

c) Rice

d) Arabidopsis

Answer: d) Arabidopsis

117. The letter "B" in Gamborg's B5 medium stands for:

a) Basal

b) Balanced

c) Bacteria

d) Biological

Answer: a) Basal

118. Gamborg's B5 medium is particularly effective for the culture of:

a) Monocotyledons

b) Woody plants

c) Herbaceous plants

d) Dicots

Answer: a) Monocotyledons

119. One of the unique components in Gamborg's B5 medium compared to other media is:

a) High nitrogen content

b) Low phosphate concentration

c) Presence of adenine sulfate

d) Absence of vitamins

Answer: c) Presence of adenine sulfate

120. Which of the following plant growth regulators is commonly added to Gamborg's B5 medium to induce shoot elongation?

a) Gibberellic acid

b) Auxin

c) Cytokinin

d) Abscisic acid

Answer: a) Gibberellic acid

121. Cytokinins primarily act on plant tissues by:

a) Promoting shoot growth

b) Inducing root development

c) Regulating leaf senescence

d) Enhancing flower formation

Answer: a) Promoting shoot growth

122. The plant hormone responsible for phototropism and elongation of seedlings is:

a) Gibberellins

b) Auxins

c) Cytokinins

d) Ethylene

Answer: b) Auxins

123. Abscisic acid (ABA) is commonly associated with:

a) Seed dormancy

b) Promoting flowering

c) Shoot elongation

d) Root initiation

Answer: a) Seed dormancy

124. Ethylene is known for its role in:

a) Promoting leaf growth

b) Inducing fruit ripening

c) Enhancing root elongation

d) Stimulating shoot formation

Answer: b) Inducing fruit ripening

125. The plant hormone responsible for cell division and differentiation in tissue culture is:

a) Gibberellins

b) Auxins

c) Cytokinins

d) Abscisic acid

Answer: c) Cytokinins

126. The plant growth regulator commonly used to induce rooting in cuttings or tissue cultures is:

a) Gibberellins

b) Cytokinins

c) Auxins

d) Abscisic acid

Answer: c) Auxins

127. The plant hormone responsible for promoting cell enlargement and fruit development is:

a) Cytokinins

b) Auxins

c) Gibberellins

d) Ethylene

Answer: c) Gibberellins

128. Which hormone is often used in tissue culture to prevent premature senescence and maintain cell division?

a) Cytokinins

b) Gibberellins

c) Auxins

d) Ethylene

Answer: a) Cytokinins

129. The hormone responsible for the triple response in plants exposed to mechanical stress or low oxygen levels is:

a) Gibberellins

b) Auxins

c) Cytokinins

d) Ethylene

Answer: d) Ethylene

130. Plant hormones, such as auxins and cytokinins, often interact in a specific ratio known as the:

a) Hormonal equilibrium

b) Hormonal balance

c) Hormonal ratio

d) Hormonal interaction

Answer: b) Hormonal balance

131. What is micropropagation?

a) Traditional plant breeding technique

b) A method of growing plants in large fields

c) A technique to produce numerous plants from small amounts of plant tissue

d) Cultivation of plants in controlled natural environments

Answer: c) A technique to produce numerous plants from small amounts of plant tissue

132. Which plant tissue is commonly used as an explant for micropropagation?

a) Leaf

b) Root

c) Stem

d) All of the above

Answer: d) All of the above

133. The growth regulator often used to induce shoot formation in micropropagation is:

a) Gibberellic acid (GA)

b) Auxin

c) Cytokinin

d) Abscisic acid (ABA)

Answer: c) Cytokinin

134. What is the primary advantage of micropropagation over traditional propagation methods?

a) Slower multiplication rate

b) Lower cost

c) Higher genetic uniformity

d) Greater susceptibility to diseases

Answer: c) Higher genetic uniformity

135. Which type of culture system is commonly used in micropropagation for the multiplication of shoots?

a) Temporary immersion bioreactors

b) Solid medium cultures

c) Hydroponic cultures

d) Aeroponic cultures

Answer: b) Solid medium cultures

136. The process of acclimatization in micropropagation refers to:

a) The initiation of cultures from explants

b) The transfer of cultures to field conditions

c) The multiplication of shoots in vitro

d) The sterilization of equipment

Answer: b) The transfer of cultures to field conditions

137. What is the role of a cytokinin in micropropagation?

a) Root initiation

b) Shoot formation

c) Leaf expansion

d) Stem elongation

Answer: b) Shoot formation

138. The use of plant tissue culture for micropropagation helps in:

a) Increasing genetic variability

b) Reducing the rate of plant multiplication

c) Preserving rare or endangered plant species

d) Decreasing the uniformity of plants

Answer: c) Preserving rare or endangered plant species

139. Which of the following is a disadvantage of micropropagation?

a) Slower multiplication rate compared to traditional methods

b) Lower cost of production

c) Genetic variability in produced plants

d) Reduced efficiency in the transfer of plants to soil

Answer: c) Genetic variability in produced plants

140. The process of shoot tip culture in micropropagation primarily involves:

a) Culturing entire stems

b) Using only the terminal buds for culture

c) Initiating root cultures

d) Applying growth hormones to leaves

Answer: b) Using only the terminal buds for culture

Micrografting:

141. What is micrografting in plant biology?

a) Grafting involving very large plant parts

b) Grafting performed under a microscope

c) Grafting performed on genetically modified plants

d) Grafting without the use of growth regulators

Answer: b) Grafting performed under a microscope

142. The primary advantage of micrografting over traditional grafting methods is:

a) Higher success rates

b) Lower cost

c) Faster healing of graft unions

d) Greater adaptability to diverse plant species

Answer: a) Higher success rates

143. The part of a plant used as the scion in micrografting is typically:

a) A root segment

b) A leaf

c) A shoot tip

d) A stem

Answer: c) A shoot tip

144. Which of the following is a requirement for successful micrografting?

a) High humidity levels

b) Direct exposure to sunlight

c) Excessive watering

d) Lack of growth regulators

Answer: a) High humidity levels

145. The main reason for performing micrografting under sterile conditions is to:

a) Increase graft success rates

b) Reduce the need for microscopes

c) Improve plant hardiness

d) Lower the cost of the procedure

Answer: a) Increase graft success rates

146. The rootstock in micrografting is chosen based on its:

a) Disease resistance

b) Shoot vigor

c) Ability to form roots easily

d) Compatibility with the scion

Answer: c) Ability to form roots easily

147. Which technique is often employed to hold the scion and rootstock together during micrografting?

a) Taping

b) Stapling

c) Clamping

d) Pinning

Answer: d) Pinning

148. The primary goal of micrografting is to:

a) Achieve genetic variation

b) Increase plant height

c) Reduce genetic uniformity

d) Transfer desirable traits from one plant to another

Answer: d) Transfer desirable traits from one plant to another

149. The process of healing the graft union in micrografting involves:

a) Fusion of vascular tissues

b) Strengthening of leaf tissues

c) Formation of new root hairs

d) Growth of new stems

Answer: a) Fusion of vascular tissues

150. Micrografting is particularly useful when:

a) Rapid plant multiplication is needed

b) Traditional grafting methods are available

c) Only small-scale grafting is required

d) Plants are grown in soil-rich environments

Answer: a) Rapid plant multiplication is needed

151. Which of the following is a characteristic feature of micrografting?

a) Grafting at mature plant stages

b) Large-scale grafting

c) Grafting without the use of specialized tools

d) Grafting under controlled and sterile conditions

Answer: d) Grafting under controlled and sterile conditions

152. The success rate of micrografting largely depends on:

a) High temperatures during the procedure

b) Low humidity levels

c) Compatibility between scion and rootstock

d) Excessive watering post-grafting

Answer: c) Compatibility between scion and rootstock

153. The process of fusing tissues together during micrografting involves the regeneration of:

a) Shoot tips

b) Vascular tissues

c) Leaf structures

d) Root segments

Answer: b) Vascular tissues

154. The primary focus of micrografting is to:

a) Reduce plant multiplication rates

b) Increase genetic variability

c) Maintain genetic uniformity

d) Accelerate root growth

Answer: c) Maintain genetic uniformity

155. One of the main challenges in micrografting is:

a) Maintaining high humidity levels

b) Achieving compatibility between different species

c) Rapid healing of graft unions

d) Reducing the need for sterile conditions

156. What is callus in plant tissue culture?

a) A type of fungal contamination

b) Undifferentiated mass of cells

c) Highly specialized root structure

d) A disease affecting plant roots

Answer: b) Undifferentiated mass of cells

157. Callus formation is initiated from:

a) Mature leaves

b) Meristematic tissues

c) Flower petals

d) Vascular bundles

Answer: b) Meristematic tissues

158. The process of inducing callus formation is facilitated by the presence of:

a) Cytokinins

b) Auxins

c) Gibberellins

d) Ethylene

Answer: b) Auxins

159. Callus tissue is generally cultured on a medium containing:

a) Only auxins

b) Only cytokinins

c) Both auxins and cytokinins

d) Neither auxins nor cytokinins

Answer: c) Both auxins and cytokinins

160. The primary purpose of callus culture in plant tissue culture is:

a) Mass production of plantlets

b) Inducing floral differentiation

c) Producing seeds in vitro

d) Studying photosynthesis

Answer: a) Mass production of plantlets

161. Callus cultures are commonly used in:

a) Traditional agricultural practices

b) Genetic modification experiments

c) Natural plant propagation

d) Soil conservation efforts

Answer: b) Genetic modification experiments

162. The term "embryogenic callus" refers to callus tissue:

a) That does not have regenerative capacity

b) With the potential to form embryos

c) Exclusively found in monocot plants

d) That lacks cell division capabilities

Answer: b) With the potential to form embryos

163. The use of activated charcoal in callus culture is primarily for:

a) Providing color to the medium

b) Reducing contamination

c) Enhancing shoot elongation

d) Stimulating callus formation

Answer: b) Reducing contamination

164. Callus cultures are mostly maintained in:

a) Liquid medium

b) Soil

c) Gaseous atmosphere

d) Solid medium

Answer: d) Solid medium

165. Which hormone is commonly used to induce callus formation?

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: c) Auxin

166. The process of subculture in callus culture involves:

a) Transferring callus to a different medium

b) Treating callus with growth regulators

c) Counting the number of cells in the callus

d) Measuring the pH of the culture medium

Answer: a) Transferring callus to a different medium

167. Callus culture is an effective method for:

a) Producing disease-resistant plants

b) Increasing soil fertility

c) Reducing environmental pollution

d) Controlling insect infestations

Answer: a) Producing disease-resistant plants

168. Callus culture often serves as an intermediary step for:

a) Cloning of plants

b) Studying plant anatomy

c) Promoting seed germination

d) Controlling weed growth

Answer: a) Cloning of plants

169. The color and texture of callus tissue depend on:

a) The amount of water in the culture medium

b) The presence of cytokinins in the medium

c) The type of plant species

d) The source of carbon in the medium

Answer: c) The type of plant species

170. Callus tissue differs from plant embryos primarily because callus:

a) Has no regenerative capacity

b) Contains differentiated cells

c) Lacks organized structures

d) Is composed of only root cells

Answer: c) Lacks organized structures

171. The primary reason for maintaining callus cultures under sterile conditions is to:

a) Enhance callus growth

b) Prevent contamination

c) Increase nutrient uptake

d) Promote shoot differentiation

Answer: b) Prevent contamination

172. Callus culture is a technique used for:

a) Flower arrangement in vitro

b) Controlled propagation of plants

c) Developing new plant species

d) Enhancing fruit ripening

Answer: b) Controlled propagation of plants

173. The process of dedifferentiation in callus culture refers to:

a) The formation of new roots

b) The loss of cellular identity

c) The development of flowers

d) The transformation of chloroplasts

Answer: b) The loss of cellular identity

174. Callus culture is widely used in:

a) Agricultural practices

b) Pest control mechanisms

c) Erosion prevention

d) Waste management

Answer: a) Agricultural practices

175. What role does light play in callus culture?

a) It stimulates root development

b) It inhibits callus formation

c) It promotes shoot elongation

d) It may or may not affect callus growth depending on the species

Answer: d) It may or may not affect callus growth depending on the species

176. The term "habituation" in callus culture refers to:

a) Acclimatizing callus to field conditions

b) Loss of callus growth potential

c) A sudden burst in callus growth

d) Callus adaptation to specific growth conditions

Answer: d) Callus adaptation to specific growth conditions

177. Which type of cells predominate in callus tissue?

a) Fully differentiated cells

b) Dead cells

c) Meristematic cells

d) Chloroplast-containing cells

Answer: c) Meristematic cells

178. The process of friable callus formation is characterized by callus tissue that is:

a) Firm and compact

b) Loose and friable

c) Green and leafy

d) Highly structured with vascular tissues

Answer: b) Loose and friable

179. Callus culture is advantageous for plant regeneration because:

a) It guarantees a higher rate of genetic variation

b) It allows for the propagation of only desirable traits

c) It facilitates the regeneration of whole plants from small tissue segments

d) It avoids the need for sterilization procedures

Answer: c) It facilitates the regeneration of whole plants from small tissue segments

180. The main disadvantage of callus culture is:

a) Lack of reproducibility in plant regeneration

b) High cost associated with the culture

c) Rapid differentiation into mature plants

d) Inability to adapt to different environmental conditions

Answer: a) Lack of reproducibility in plant regeneration

Somatic Embryogenesis

181. What is somatic embryogenesis?

a) A process of fertilization in plants

b) A method of artificial pollination

c) Formation of embryos from somatic cells in tissue culture

d) A natural process of seed development

Answer: c) Formation of embryos from somatic cells in tissue culture

182. The embryogenic callus formed during somatic embryogenesis primarily consists of:

a) Only root cells

b) Undifferentiated cells capable of embryo formation

c) Vascular tissues

d) Only shoot cells

Answer: b) Undifferentiated cells capable of embryo formation

183. The process of somatic embryogenesis typically involves the use of:

a) Only cytokinins

b) Only auxins

c) Both auxins and cytokinins

d) Ethylene

Answer: c) Both auxins and cytokinins

184. The cells that undergo somatic embryogenesis are typically derived from:

a) Meristematic tissues

b) Fully differentiated cells

c) Vascular tissues

d) Root hairs

Answer: a) Meristematic tissues

185. The primary application of somatic embryogenesis in plant science is:

a) Mass production of seeds

b) Producing genetically modified plants

c) Inducing flower formation in plants

d) Controlling weed growth

Answer: b) Producing genetically modified plants

186. Somatic embryogenesis is particularly useful for the:

a) Production of disease-resistant plants

b) Producing seeds in vitro

c) Reducing genetic uniformity

d) Controlling plant growth

Answer: a) Production of disease-resistant plants

187. The term "somatic embryos" refers to:

a) Embryos formed through natural pollination

b) Embryos formed in artificial environments

c) Embryos produced from somatic cells

d) Embryos produced from gametic cells

Answer: c) Embryos produced from somatic cells

188. Somatic embryogenesis typically occurs in:

a) Natural plant environments

b) Controlled laboratory conditions

c) Soil-rich environments

d) Arid regions

Answer: b) Controlled laboratory conditions

189. The primary hormone responsible for inducing somatic embryogenesis is:

a) Abscisic acid

b) Gibberellins

c) Cytokinins

d) Ethylene

Answer: c) Cytokinins

190. The process of maturation in somatic embryogenesis refers to:

a) Growth of embryos in soil

b) Development of embryos into seed-like structures

c) Cell division in embryonic tissues

d) Fusion of embryos with gametes

Answer: b) Development of embryos into seed-like structures

191. The stage of somatic embryogenesis that resembles a zygotic embryo is the:

a) Induction stage

b) Maturation stage

c) Development stage

d) Early differentiation stage

Answer: b) Maturation stage

192. Somatic embryogenesis differs from zygotic embryogenesis mainly because it occurs:

a) In controlled laboratory conditions

b) In natural pollination environments

c) Only in monocot plants

d) In the absence of cytokinins

Answer: a) In controlled laboratory conditions

193. The primary advantage of somatic embryogenesis over traditional propagation methods is:

a) Lower success rates

b) Higher cost

c) Production of genetically identical plants

d) Lack of adaptability to different growth conditions

Answer: c) Production of genetically identical plants

194. The main focus of somatic embryogenesis is on:

a) Increasing genetic variability

b) Generating haploid plants

c) Clonal propagation of plants

d) Stimulating fruit formation

Answer: c) Clonal propagation of plants

195. The primary reason for maintaining somatic embryogenesis cultures under sterile conditions is to:

a) Increase growth rate

b) Prevent contamination

c) Enhance nutrient uptake

d) Promote shoot elongation

Answer: b) Prevent contamination

196. Somatic embryogenesis is particularly useful for:

a) Speeding up the growth of plants

b) Propagating plants with desired traits

c) Enhancing root development

d) Preventing leaf senescence

Answer: b) Propagating plants with desired traits

197. The process of germination in somatic embryogenesis involves:

a) Formation of new roots

b) Development of embryo into a mature plant

c) Induction of floral differentiation

d) Transfer of embryos to field conditions

Answer: b) Development of embryo into a mature plant

198. Somatic embryogenesis is advantageous in:

a) Reducing genetic diversity

b) Facilitating controlled hybridization

c) Increasing plant susceptibility to diseases

d) Promoting root growth

Answer: b) Facilitating controlled hybridization

199. The process of desiccation in somatic embryogenesis involves:

a) Rehydration of embryos

b) Dehydration of embryos to induce dormancy

c) Shoot elongation in embryos

d) Exposure to high humidity

Answer: b) Dehydration of embryos to induce dormancy

200. The term "somatic embryogenesis receptor kinase" (SERK) refers to:

a) A hormone involved in root development

b) A protein involved in somatic embryogenesis initiation

c) A growth regulator responsible for leaf formation

d) An enzyme for shoot elongation

Answer: b) A protein involved in somatic embryogenesis initiation

201. The process of desiccation tolerance in somatic embryogenesis refers to the:

a) Embryo's ability to survive drying

b) Embryo's need for continuous watering

c) Embryo's preference for high humidity

d) Induction of root elongation

Answer: a) Embryo's ability to survive drying

202. The stage of somatic embryogenesis where embryos acquire polarity and structural organization is:

a) Maturation

b) Germination

c) Induction

d) Development

Answer: c) Induction

203. Somatic embryogenesis is particularly beneficial for:

a) Studying seed germination

b) Mass production of plants with desired traits

c) Enhancing flower formation

d) Regulating shoot elongation

Answer: b) Mass production of plants with desired traits

204. The process of secondary embryogenesis involves:

a) Formation of secondary roots in embryos

b) Production of embryos from existing embryos

c) Shoot elongation in embryos

d) Developing embryos into mature plants

Answer: b) Production of embryos from existing embryos

205. The term "embryogenic cultures" refers to cultures containing:

a) Only fully developed embryos

b) A mix of zygotic and somatic embryos

c) Only somatic embryos

d) Embryo-like structures with regenerative capacity

Answer: d) Embryo-like structures with regenerative capacity

206. Somatic embryogenesis is particularly suitable for the propagation of:

a) Plants with reduced yield

b) Plants with high seed germination rates

c) Plants with desirable traits that are hard to propagate conventionally

d) Plants with rapid seed maturation

Answer: c) Plants with desirable traits that are hard to propagate conventionally

207. The stage of somatic embryogenesis that mimics the early stages of zygotic embryogenesis is the:

a) Maturation stage

b) Germination stage

c) Induction stage

d) Development stage

Answer: c) Induction stage

208. The primary hormone used for inducing somatic embryogenesis in conifers is:

a) Auxin

b) Gibberellins

c) Ethylene

d) Abscisic acid

Answer: a) Auxin

209. The process of cryopreservation in somatic embryogenesis involves:

a) Rapid seed germination

b) Long-term storage of embryos at low temperatures

c) Induction of flowering in embryos

d) Drying of embryos for preservation

Answer: b) Long-term storage of embryos at low temperatures

210. Which of the following is a primary challenge in somatic embryogenesis?

a) Maintaining high humidity levels

b) Overcoming embryonic dormancy

c) Achieving genetic variation

d) Reducing callus formation

Answer: b) Overcoming embryonic dormancy

211. The term "pro-embryo" refers to the:

a) Early stage of somatic embryogenesis

b) Mature embryo ready for planting

c) Somatic embryo undergoing germination

d) Embryogenic callus

Answer: a) Early stage of somatic embryogenesis

212. The process of encapsulation in somatic embryogenesis involves:

a) Drying of embryos for storage

b) Coating embryos with a protective material

c) Formation of secondary embryos

d) Inducing root development

Answer: b) Coating embryos with a protective material

213. The technique used to ensure high conversion rates of somatic embryos into plants is called:

a) Dehydration

b) Encapsulation

c) Maturation

d) Germination

Answer: c) Maturation

214. The role of polyethylene glycol (PEG) in somatic embryogenesis is primarily to:

a) Induce flowering in somatic embryos

b) Enhance embryo growth

c) Improve desiccation tolerance

d) Stimulate root elongation

Answer: c) Improve desiccation tolerance

215. The main advantage of somatic embryogenesis in horticulture is:

a) Faster growth rates of plants

b) Reduced cost of plant production

c) Production of genetically uniform plants

d) Induction of leaf senescence

Answer: c) Production of genetically uniform plants

216. What is suspension culture in plant tissue culture?

a) Culturing plant cells in a solid medium

b) Culturing plant cells in a liquid medium

c) Growing plants in soil-based media

d) Growing plants in hydroponic systems

Answer: b) Culturing plant cells in a liquid medium

217. The term "suspension" in suspension culture refers to:

a) Suspension of cell division

b) Suspension of root growth

c) Cells floating freely in the medium

d) Induction of leaf senescence

Answer: c) Cells floating freely in the medium

218 The primary advantage of suspension culture over traditional cultures on solid media is:

a) Lower growth rate

b) Ease of scalability

c) Increased genetic variability

d) Enhanced root development

Answer: b) Ease of scalability

219. The main purpose of using a suspension culture in plant tissue culture is:

a) Inducing flowering in plants

b) Large-scale production of plant cells

c) Controlling pest infestations

d) Studying leaf anatomy

Answer: b) Large-scale production of plant cells

220. The cells in suspension culture are typically agitated to:

a) Slow down cell growth

b) Promote cell differentiation

c) Prevent oxygen uptake

d) Ensure even distribution of nutrients and oxygen

Answer: d) Ensure even distribution of nutrients and oxygen

221. The cells in suspension culture are maintained in suspension through:

a) Regular addition of growth inhibitors

b) Continuous aeration or stirring

c) Using high concentrations of salts

d) Reducing the light intensity

Answer: b) Continuous aeration or stirring

222. What type of vessel is commonly used for suspension cultures?

a) Petri dish

b) Erlenmeyer flask or bioreactor

c) Test tube

d) Beaker

Answer: b) Erlenmeyer flask or bioreactor

223. The purpose of inoculum in suspension culture is to:

a) Decrease the growth rate

b) Increase contamination

c) Initiate cell growth in the culture

d) Prevent cell division

Answer: c) Initiate cell growth in the culture

224. The primary method of subculturing cells in suspension culture involves:

a) Transferring cells to a solid medium

b) Adding growth inhibitors to the culture

c) Diluting cells into a fresh medium

d) Reducing aeration in the culture vessel

Answer: c) Diluting cells into a fresh medium

225. The cells in suspension culture are most commonly derived from:

a) Meristematic tissues

b) Fully differentiated cells

c) Mature leaves

d) Root segments

Answer: a) Meristematic tissues

226. The main focus of suspension culture is on:

a) Inducing senescence in cells

b) Increasing genetic variability

c) Mass production of cells

d) Reducing cell proliferation

Answer: c) Mass production of cells

227. The process of callus formation is usually a precursor to:

a) Embryo development

b) Senescence of cells

c) Stunted root growth

d) Increased shoot elongation

Answer: a) Embryo development

228. The use of growth regulators in suspension culture is primarily for:

a) Inhibiting cell division

b) Promoting cell differentiation

c) Reducing oxygen uptake

d) Preventing nutrient uptake

Answer: b) Promoting cell differentiation

229. The cells in suspension culture are more susceptible to:

a) Drying out

b) Root development

c) Contamination

d) Senescence

Answer: c) Contamination

230. The primary advantage of suspension culture over traditional tissue culture methods is its:

a) Slower growth rate

b) Potential for greater scale-up

c) Lower genetic stability

d) Reduced need for aeration

Answer: b) Potential for greater scale-up

231. The process of maintaining suspension cultures under sterile conditions primarily aims to:

a) Increase contamination

b) Promote cell division

c) Decrease cell differentiation

d) Prevent microbial contamination

Answer: d) Prevent microbial contamination

232. The technique used to measure cell growth in suspension culture is:

a) Titration

b) Coulter counter

c) Spectrophotometry

d) Microscopy

Answer: b) Coulter counter

233. The term "batch culture" in suspension culture refers to:

a) Continuous addition of fresh medium

b) Regular subculture intervals

c) Single addition of medium without replenishment

d) Use of growth inhibitors

Answer: c) Single addition of medium without replenishment

234. Suspension cultures are used primarily for:

a) Increasing soil fertility

b) Controlling pest infestations

c) Large-scale production of secondary metabolites

d) Reducing plant growth

Answer: c) Large-scale production of secondary metabolites

235. The primary hormone used to induce cell division in suspension culture is:

a) Gibberellins

b) Auxin

c) Cytokinins

d) Abscisic acid

Answer: c) Cytokinins

236. The term "bioreactor" in suspension culture refers to:

a) A vessel used for cooking plant tissue

b) A container for storage of cell cultures

c) A reactor for biological research

d) A vessel for controlled cell growth and production

Answer: d) A vessel for controlled cell growth and production

237. The process of "passaging" in suspension culture involves:

a) Addition of fresh nutrients to the culture

b) Transferring cells to a solid medium

c) Subculture of cells into fresh medium

d) Reducing aeration in the vessel

Answer: c) Subculture of cells into fresh medium

238. The primary challenge in maintaining suspension culture is:

a) Reducing cell division

b) Ensuring continuous aeration

c) Increasing contamination

d) Slowing down nutrient uptake

Answer: c) Increasing contamination

239. Suspension cultures are advantageous for:

a) Decreasing cell proliferation rates

b) Controlling pest infestations

c) Maintaining genetic stability

d) Producing a large quantity of cells in a limited space

Answer: d) Producing a large quantity of cells in a limited space

240. The process of "cell immobilization" in suspension culture refers to:

a) Arresting cell division

b) Fixing cells to a solid support

c) Inducing leaf senescence

d) Reducing oxygen uptake by cells

Answer: b) Fixing cells to a solid support

241. The primary goal of suspension culture is to:

a) Inhibit cell growth

b) Produce a single type of cell

c) Achieve maximum cell division

d) Produce a large number of cells with desired properties

Answer: d) Produce a large number of cells with desired properties

242. The process of cell aggregation in suspension culture leads to:

a) Reduced contamination

b) Decreased cell viability

c) Enhanced cell differentiation

d) Lower nutrient uptake

Answer: a) Reduced contamination

243. The technique used to monitor cell viability in suspension culture is:

a) Titration

b) Coulter counter

c) Microscopy

d) Spectrophotometry

Answer: c) Microscopy

244. The term "cell density" in suspension culture refers to:

a) The amount of cellular waste

b) The ratio of dead cells to live cells

c) The number of cells per unit volume

d) The size of individual cells

Answer: c) The number of cells per unit volume

245. The primary challenge in scaling up suspension cultures is:

a) Decreasing agitation

b) Increasing nutrient supply

c) Achieving uniform cell distribution

d) Reducing aeration

Answer: c) Achieving uniform cell distribution

246. The use of elicitors in suspension culture is primarily for:

a) Inhibiting cell division

b) Inducing stress responses and secondary metabolite production

c) Promoting cell differentiation

d) Enhancing root development

Answer: b) Inducing stress responses and secondary metabolite production

247. The term "microcarriers" in suspension culture refers to:

a) Small cells used for initiation of culture

b) Miniature vessels for cell growth

c) Small solid particles for cell attachment and growth

d) Small molecules for growth inhibition

Answer: c) Small solid particles for cell attachment and growth

248. The process of "foam formation" in suspension culture occurs due to:

a) Increased cell density

b) Decreased aeration

c) Decreased agitation

d) Excessive surfactant presence

Answer: d) Excessive surfactant presence

249. The primary factor affecting cell growth in suspension culture is:

a) Temperature fluctuations

b) Oxygen levels

c) pH variations

d) Light intensity

Answer: b) Oxygen levels

250. The term "flocculation" in suspension culture refers to:

a) The addition of flocculating agents to enhance cell viability

b) Aggregation or clumping of cells

c) Suspension of cell division

d) Continuous aeration of cells

Answer: b) Aggregation or clumping of cells

251. The main challenge in large-scale suspension cultures is:

a) Increasing nutrient supply

b) Achieving uniform cell distribution

c) Reducing cell aggregation

d) Decreasing agitation

Answer: b) Achieving uniform cell distribution

252. The process of "cryopreservation" in suspension culture involves:

a) Long-term storage of cells in liquid nitrogen

b) Rapid cell division in freezing temperatures

c) Reduction of cell density for preservation

d) Increasing oxygen levels in culture

Answer: a) Long-term storage of cells in liquid nitrogen

253. The term "agitated culture" refers to:

a) Cell culture with reduced agitation

b) Continuous aeration of cells

c) Cell culture with increased agitation or stirring

d) Fixed cells in culture

Answer: c) Cell culture with increased agitation or stirring

254. The primary advantage of using microcarriers in suspension culture is:

a) Enhanced cell differentiation

b) Decreased contamination risk

c) Increased cell density

d) Improved nutrient uptake

Answer: b) Decreased contamination risk

255. The process of "harvesting" in suspension culture refers to:

a) Diluting cells into a fresh medium

b) Removing cells from the culture medium

c) Subculturing cells into a new vessel

d) Adding growth regulators to the culture

Answer: b) Removing cells from the culture medium

256. The term "encapsulation" in suspension culture refers to:

a) Attachment of cells to microcarriers

b) Coating cells with a protective material

c) Continuous agitation of cells

d) Induction of cell differentiation

Answer: b) Coating cells with a protective material

257. The main limitation of suspension cultures is:

a) Lower contamination risk

b) Limited scalability

c) Enhanced cell differentiation

d) Reduced nutrient uptake

Answer: b) Limited scalability

258. The technique used for continuous supply of nutrients in suspension culture is called:

a) Batch culture

b) Fed-batch culture

c) Agitated culture

d) Encapsulated culture

Answer: b) Fed-batch culture

259. The primary function of using surfactants in suspension culture is to:

a) Promote cell differentiation

b) Increase cell proliferation rates

c) Prevent cell aggregation

d) Decrease nutrient uptake

Answer: c) Prevent cell aggregation

260. The main challenge in maintaining continuous agitation in suspension culture is:

a) Preventing cell division

b) Ensuring even nutrient distribution

c) Reducing oxygen uptake

d) Decreasing contamination

Answer: b) Ensuring even nutrient distribution

261. The process of "filtration" in suspension culture refers to:

a) Removal of dead cells from the culture

b) Encapsulation of cells in a filter membrane

c) Continuous aeration of cells

d) Attaching cells to microcarriers

Answer: a) Removal of dead cells from the culture

262. The term "cell viability" in suspension culture refers to:

a) The number of live cells in the culture

b) The number of dead cells in the culture

c) The growth rate of cells

d) The size of individual cells

Answer: a) The number of live cells in the culture

263.The primary challenge in scaling up suspension cultures is:

a) Reducing agitation

b) Ensuring proper aeration

c) Achieving uniform nutrient distribution

d) Controlling cell aggregation

Answer: c) Achieving uniform nutrient distribution

264. The process of "cell lysis" in suspension culture refers to:

a) Cell attachment to microcarriers

b) Breakdown or disintegration of cells

c) Continuous agitation of cells

d) Induction of cell differentiation

Answer: b) Breakdown or disintegration of cells

265.. The primary goal of suspension culture is to:

a) Reduce cell density

b) Increase contamination risk

c) Achieve large-scale cell production

d) Inhibit cell differentiation

Answer: c) Achieve large-scale cell production

266. What is embryo culture in plant tissue culture?

a) Culturing mature seeds

b) Culturing whole plants

c) Culturing embryos derived from seeds in vitro

d) Culturing roots in a liquid medium

Answer: c) Culturing embryos derived from seeds in vitro

267. The primary objective of embryo culture is:

a) Reducing seed germination rates

b) Production of haploid plants

c) Growing plants in soil-based media

d) Rescuing embryos from aborted seeds for growth in vitro

Answer: d) Rescuing embryos from aborted seeds for growth in vitro

268. The primary application of embryo culture in plant science is:

a) Increasing seed production

b) Developing genetically modified plants

c) Rescue of hybrid embryos

d) Enhancing root development

Answer: c) Rescue of hybrid embryos

269. Embryo culture is particularly useful for rescuing embryos that fail due to:

a) Low humidity levels

b) Genetic abnormalities

c) Excess nutrient uptake

d) Poor soil conditions

Answer: b) Genetic abnormalities

270. The primary technique used in embryo culture is to culture embryos:

a) In isolation from other tissues

b) On soil-based media

c) With fully developed cotyledons

d) In the presence of mature plants

Answer: a) In isolation from other tissues

271. The cells used for embryo culture are typically derived from:

a) Meristematic tissues

b) Fully differentiated cells

c) Mature leaves

d) Root segments

Answer: a) Meristematic tissues

272. The embryos used for culture are typically at what stage of development?

a) Early developmental stage

b) Fully matured stage

c) Dormant stage

d) Late senescence stage

Answer: a) Early developmental stage

273. The primary medium used in embryo culture is rich in:

a) Auxins

b) Cytokinins

c) Growth inhibitors

d) Sucrose

Answer: d) Sucrose

274. The primary challenge in embryo culture is to:

a) Promote rapid seed germination

b) Prevent genetic abnormalities

c) Increase root development

d) Overcome embryo dormancy and support growth

Answer: d) Overcome embryo dormancy and support growth

275. The primary hormone used in embryo culture is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

276. The primary aim of using growth regulators in embryo culture is to:

a) Inhibit cell division

b) Promote cell differentiation and growth

c) Induce leaf senescence

d) Prevent nutrient uptake

Answer: b) Promote cell differentiation and growth

277. The primary benefit of embryo culture over traditional methods is:

a) Lower success rates

b) Higher cost

c) Rescue and growth of abnormal embryos

d) Increased dependence on soil-based growth

Answer: c) Rescue and growth of abnormal embryos

278. The primary hormone responsible for breaking embryo dormancy is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

279. The main challenge in embryo culture is to provide:

a) Reduced nutrient supply

b) Aeration to embryos

c) Excessive light exposure

d) Low humidity levels

Answer: b) Aeration to embryos

280. The primary goal of embryo culture is to:

a) Promote rapid seed germination

b) Overcome embryo dormancy and support growth

c) Prevent genetic variability

d) Reduce cell proliferation rates

Answer: b) Overcome embryo dormancy and support growth

281. The process of maturation in embryo culture involves:

a) Arresting embryo growth

b) Developing embryos into mature plants

c) Inducing seed dormancy

d) Reducing nutrient uptake

Answer: b) Developing embryos into mature plants

282. The term "embryo rescue" refers to:

a) Saving embryos from natural pollination

b) Saving embryos from in vitro culture

c) Saving embryos from senescence

d) Saving embryos from genetic abnormalities

Answer: b) Saving embryos from in vitro culture

283. The primary purpose of maintaining embryo cultures under sterile conditions is to:

a) Increase contamination

b) Promote genetic variability

c) Enhance nutrient uptake

d) Prevent microbial contamination

Answer: d) Prevent microbial contamination

284. The technique used to ensure the highest survival rates in embryo culture is:

a) Continuous aeration

b) Inhibiting embryo growth

c) Ensuring proper humidity levels

d) Maintaining genetic variability

Answer: c) Ensuring proper humidity levels

285. The stage of embryo culture that ensures a transition from an immature to a mature embryo is:

a) Induction stage

b) Maturation stage

c) Development stage

d) Early differentiation stage

Answer: b) Maturation stage

286. The primary hormone used for inducing embryo growth and overcoming dormancy is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

287. The primary focus of embryo culture is on:

a) Inducing leaf formation

b) Reducing genetic variability

c) Clonal propagation of plants

d) Overcoming developmental abnormalities

Answer: d) Overcoming developmental abnormalities

288. The process of desiccation in embryo culture involves:

a) Rehydration of embryos

b) Dehydration of embryos to induce dormancy

c) Shoot elongation in embryos

d) Exposure to high humidity

Answer: b) Dehydration of embryos to induce dormancy

289. The term "embryogenic cultures" refers to cultures containing:

a) Only fully developed embryos

b) A mix of zygotic and somatic embryos

c) Only somatic embryos

d) Embryo-like structures with regenerative capacity

Answer: d) Embryo-like structures with regenerative capacity

290. The stage of embryo culture that resembles a zygotic embryo is the:

a) Maturation stage

b) Germination stage

c) Induction stage

d) Development stage

Answer: c) Induction stage

291. What is haploid culture in plant tissue culture?

a) Culturing cells with diploid chromosome sets

b) Culturing cells with tetraploid chromosome sets

c) Culturing cells with a single set of chromosomes

d) Culturing cells with multiple sets of chromosomes

Answer: c) Culturing cells with a single set of chromosomes

292. The primary objective of haploid culture is to:

a) Increase genetic variability

b) Produce plants with reduced fertility

c) Generate plants with doubled chromosome sets

d) Produce plants with a single chromosome set

Answer: d) Produce plants with a single chromosome set

293. Haploid plants are typically obtained from:

a) Zygotic embryos

b) Somatic embryos

c) Microspores or ovules

d) Root segments

Answer: c) Microspores or ovules

294. The primary application of haploid culture in plant science is:

a) Increasing seed production

b) Developing genetically modified plants

c) Creating hybrid vigor

d) Producing homozygous lines quickly

Answer: d) Producing homozygous lines quickly

295. The technique used to induce haploid formation in plant cells is called:

a) Callus induction

b) Embryo rescue

c) Anther or pollen culture

d) Somatic embryogenesis

Answer: c) Anther or pollen culture

296. The cells used for haploid culture are typically derived from:

a) Meristematic tissues

b) Fully differentiated cells

c) Mature leaves

d) Microspores or ovules

Answer: d) Microspores or ovules

297. The main focus of haploid culture is on:

a) Inducing leaf formation

b) Reducing genetic variability

c) Producing homozygous lines quickly

d) Generating diploid plants

Answer: c) Producing homozygous lines quickly

298. The primary medium used in haploid culture is rich in:

a) Auxins

b) Cytokinins

c) Growth inhibitors

d) Sucrose

Answer: b) Cytokinins

299. The primary hormone used in inducing haploid formation is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

300. The primary challenge in haploid culture is to:

a) Promote rapid seed germination

b) Increase chromosome sets

c) Overcome chromosome duplication

d) Develop haploid plants efficiently

Answer: d) Develop haploid plants efficiently

301. The primary goal of haploid culture is to:

a) Promote rapid seed germination

b) Produce homozygous lines quickly

c) Prevent genetic variability

d) Reduce cell proliferation rates

Answer: b) Produce homozygous lines quickly

302. The process of chromosome doubling in haploid plants results in:

a) Diploid plants

b) Tetraploid plants

c) Triploid plants

d) Haploid plants

Answer: b) Tetraploid plants

303. The primary hormone used for inducing chromosome doubling in haploid plants is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Colchicine

Answer: d) Colchicine

304. The main challenge in haploid culture is to provide:

a) Reduced nutrient supply

b) Aeration to microspores or ovules

c) Excessive light exposure

d) Low humidity levels

Answer: b) Aeration to microspores or ovules

305. The term "haploid plants" refers to plants with:

a) Multiple chromosome sets

b) A single chromosome set

c) Reduced fertility

d) Increased genetic variability

Answer: b) A single chromosome set

306. The process of chromosome reduction in haploid plants is termed:

a) Chromosome amplification

b) Chromosome doubling

c) Haploidization

d) Tetraploidization

Answer: c) Haploidization

307. The primary hormone used in microspore culture for haploid formation is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

308. The primary focus of haploid culture is on:

a) Inducing leaf formation

b) Reducing genetic variability

c) Producing homozygous lines quickly

d) Generating diploid plants

Answer: c) Producing homozygous lines quickly

309. The main challenge in haploid culture is to ensure:

a) Decreased chromosome sets

b) Proper chromosome doubling

c) Reduced cell viability

d) Increased genetic variability

Answer: b) Proper chromosome doubling

310. The process of maturation in haploid culture involves:

a) Arresting embryo growth

b) Developing embryos into mature plants

c) Inducing seed dormancy

d) Reducing nutrient uptake

Answer: b) Developing embryos into mature plants

311. The primary hormone used for inducing haploid formation is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

312. The primary focus of haploid culture is on:

a) Inducing leaf formation

b) Reducing genetic variability

c) Producing homozygous lines quickly

d) Generating diploid plants

Answer: c) Producing homozygous lines quickly

313. The process of desiccation in haploid culture involves:

a) Rehydration of microspores or ovules

b) Dehydration of microspores or ovules to induce dormancy

c) Shoot elongation in microspores or ovules

d) Exposure to high humidity

Answer: b) Dehydration of microspores or ovules to induce dormancy

314. The term "haploidization" refers to:

a) Chromosome reduction in plants

b) Inducing diploid plants

c) Chromosome doubling in plants

d) Genetic variability in plants

Answer: a) Chromosome reduction in plants

315. The stage of haploid culture that ensures the development of haploid plants is the:

a) Induction stage

b) Maturation stage

c) Development stage

d) Early differentiation stage

Answer: c) Development stage

316. The primary hormone used for inducing chromosome doubling in haploid plants is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Colchicine

Answer: d) Colchicine

317. The primary advantage of haploid culture is:

a) Reduced genetic variability

b) Increased chromosome sets

c) Enhanced fertility

d) Rapid production of homozygous lines

Answer: d) Rapid production of homozygous lines

318. The term "haploid plants" refers to plants with:

a) Multiple chromosome sets

b) A single chromosome set

c) Reduced fertility

d) Increased genetic variability

Answer: b) A single chromosome set

319. The process of chromosome doubling in haploid plants results in:

a) Diploid plants

b) Tetraploid plants

c) Triploid plants

d) Haploid plants

Answer: b) Tetraploid plants

320. The primary hormone used in microspore culture for haploid formation is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

321. What are protoplasts in plant tissue culture?

a) Partially differentiated cells

b) Cells lacking cell walls

c) Cells with enhanced cell walls

d) Cells with multiple nuclei

Answer: b) Cells lacking cell walls

322. The primary objective of protoplast culture is:

a) To enhance cell wall development

b) To induce cell differentiation

c) To facilitate plant regeneration

d) To inhibit cell division

Answer: c) To facilitate plant regeneration

323. Protoplasts are commonly derived from:

a) Meristematic tissues

b) Fully differentiated cells

c) Mature leaves

d) Root segments

Answer: a) Meristematic tissues

324. The process used to isolate protoplasts involves:

a) Removing the cytoplasm

b) Removing the vacuole

c) Enzymatic digestion of the cell wall

d) Enhancing cell division

Answer: c) Enzymatic digestion of the cell wall

325. The primary application of protoplast culture in plant science is:

a) Production of seeds

b) Genetic transformation

c) Reducing genetic variability

d) Enhancing leaf growth

Answer: b) Genetic transformation

326. The technique used to regenerate plants from protoplasts involves:

a) Induction of leaf senescence

b) Induction of callus formation

c) Reducing cell viability

d) Stopping cell differentiation

Answer: b) Induction of callus formation

327. Protoplasts are typically cultured in a medium containing:

a) High concentrations of cellulose

b) Low levels of enzymes

c) Sugars and growth regulators

d) Reduced nutrient supply

Answer: c) Sugars and growth regulators

328. The primary hormone used in protoplast culture is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Cytokinins

Answer: d) Cytokinins

329. The main focus of protoplast culture is on:

a) Inducing leaf formation

b) Reducing genetic variability

c) Producing genetically modified plants

d) Generating diploid plants

Answer: c) Producing genetically modified plants

330. Protoplast fusion involves:

a) Formation of a single cell

b) Fusion of two or more protoplasts to form a hybrid

c) Isolation of protoplasts

d) Inducing cell division

Answer: b) Fusion of two or more protoplasts to form a hybrid

331. The technique used to induce protoplast fusion involves:

a) Reducing aeration

b) Inhibiting cell growth

c) Electrofusion or chemical treatment

d) Reducing nutrient supply

Answer: c) Electrofusion or chemical treatment

332. The primary hormone used in protoplast fusion is:

a) Abscisic acid

b) Ethylene

c) Auxin

d) Gibberellins

Answer: d) Gibberellins

333. The main advantage of protoplast fusion is:

a) Increased genetic variability

b) Reduced chromosome number

c) Enhanced cell wall development

d) Induction of leaf senescence

Answer: a) Increased genetic variability

334. The primary challenge in protoplast fusion is to:

a) Decrease fusion efficiency

b) Achieve cell differentiation

c) Enhance cell wall development

d) Overcome rejection of fused protoplasts

Answer: d) Overcome rejection of fused protoplasts

335. The primary goal of protoplast fusion is to:

a) Produce genetically modified plants

b) Reduce genetic variability

c) Inhibit cell division

d) Increase chromosome number

Answer: a) Produce genetically modified plants

336. The process of protoplast culture primarily aims to:

a) Promote rapid seed germination

b) Enhance cell wall formation

c) Facilitate plant regeneration

d) Reduce chromosome number

Answer: c) Facilitate plant regeneration

337. The primary hormone used in protoplast culture is for:

a) Inducing leaf senescence

b) Inhibiting cell division

c) Promoting cell differentiation

d) Preventing nutrient uptake

Answer: c) Promoting cell differentiation

338. Protoplasts are most commonly derived from:

a) Mature leaves

b) Fully differentiated cells

c) Meristematic tissues

d) Root segments

Answer: c) Meristematic tissues

339. The primary challenge in protoplast culture is to provide:

a) Reduced nutrient supply

b) Aeration to protoplasts

c) Excessive light exposure

d) Low humidity levels

Answer: b) Aeration to protoplasts

340. The technique used to regenerate plants from protoplasts is:

a) Induction of callus formation

b) Induction of leaf senescence

c) Inhibition of cell division

d) Enhancing chromosome number

Answer: a) Induction of callus formation

341. The primary hormone used in protoplast fusion is for:

a) Inducing leaf formation

b) Reducing genetic variability

c) Producing genetically modified plants

d) Generating diploid plants

Answer: c) Producing genetically modified plants

342. The main challenge in protoplast fusion is to ensure:

a) Increased chromosome number

b) Proper fusion efficiency

c) Reduced cell viability

d) Reduced genetic variability

Answer: b) Proper fusion efficiency

343. The process of protoplast fusion primarily aims to:

a) Induce leaf formation

b) Reduce genetic variability

c) Facilitate plant regeneration

d) Increase chromosome number

Answer: c) Facilitate plant regeneration

344. The primary hormone used in protoplast fusion is for:

a) Inducing leaf senescence

b) Inhibiting cell division

c) Promoting cell differentiation

d) Preventing nutrient uptake

Answer: c) Promoting cell differentiation

345. Protoplast culture primarily focuses on:

a) Inducing leaf formation

b) Enhancing genetic variability

c) Producing genetically modified plants

d) Generating diploid plants

Answer: c) Producing genetically modified plants

346. The main challenge in protoplast culture is to ensure:

a) Decreased chromosome number

b) Proper fusion efficiency

c) Reduced cell viability

d) Reduced genetic variability

Answer: c) Reduced cell viability

347. The process of protoplast fusion primarily aims to:

a) Induce leaf formation

b) Reduce genetic variability

c) Facilitate plant regeneration

d) Increase chromosome number

Answer: c) Facilitate plant regeneration

348. The primary hormone used in protoplast fusion is for:

a) Inducing leaf senescence

b) Inhibiting cell division

c) Promoting cell differentiation

d) Preventing nutrient uptake

Answer: c) Promoting cell differentiation

349. The main advantage of protoplast fusion is:

a) Increased genetic variability

b) Reduced chromosome number

c) Enhanced cell wall development

d) Induction of leaf senescence

Answer: a) Increased genetic variability

350. The primary goal of protoplast fusion is to:

a) Produce genetically modified plants

b) Reduce genetic variability

c) Inhibit cell division

d) Increase chromosome number

Answer: a) Produce genetically modified plants

351. The technique used to induce protoplast fusion involves:

a) Reducing aeration

b) Inhibiting cell growth

c) Electrofusion or chemical treatment

d) Reducing nutrient supply

Answer: c) Electrofusion or chemical treatment

352. The primary hormone used in protoplast fusion is for:

a) Inducing leaf formation

b) Reducing genetic variability

c) Producing genetically modified plants

d) Generating diploid plants

Answer: c) Producing genetically modified plants

353. The main challenge in protoplast fusion is to:

a) Decrease fusion efficiency

b) Achieve cell differentiation

c) Enhance cell wall development

d) Overcome rejection of fused protoplasts

Answer: d) Overcome rejection of fused protoplasts

354. The primary goal of protoplast fusion is to:

a) Produce genetically modified plants

b) Reduce genetic variability

c) Inhibit cell division

d) Increase chromosome number

Answer: a) Produce genetically modified plants

355. The process of protoplast culture primarily aims to:

a) Promote rapid seed germination

b) Enhance cell wall formation

c) Facilitate plant regeneration

d) Reduce chromosome number

Answer: c) Facilitate plant regeneration

356. The primary hormone used in protoplast culture is for:

a) Inducing leaf senescence

b) Inhibiting cell division

c) Promoting cell differentiation

d) Preventing nutrient uptake

Answer: c) Promoting cell differentiation

357. Protoplasts are most commonly derived from:

a) Mature leaves

b) Fully differentiated cells

c) Meristematic tissues

d) Root segments

Answer: c) Meristematic tissues

358. The primary challenge in protoplast culture is to provide:

a) Reduced nutrient supply

b) Aeration to protoplasts

c) Excessive light exposure

d) Low humidity levels

Answer: b) Aeration to protoplasts

359. The technique used to regenerate plants from protoplasts is:

a) Induction of callus formation

b) Induction of leaf senescence

c) Inhibition of cell division

d) Enhancing chromosome number

Answer: a) Induction of callus formation

360. The primary hormone used in protoplast fusion is for:

a) Inducing leaf formation

b) Reducing genetic variability

c) Producing genetically modified plants

d) Generating diploid plants

Answer: c) Producing genetically modified plants

361. The main challenge in protoplast fusion is to ensure:

a) Increased chromosome number

b) Proper fusion efficiency

c) Reduced cell viability

d) Reduced genetic variability

Answer: b) Proper fusion efficiency

362. The process of protoplast fusion primarily aims to:

a) Induce leaf formation

b) Reduce genetic variability

c) Facilitate plant regeneration

d) Increase chromosome number

Answer: c) Facilitate plant regeneration

363. The primary hormone used in protoplast fusion is for:

a) Inducing leaf senescence

b) Inhibiting cell division

c) Promoting cell differentiation

d) Preventing nutrient uptake

Answer: c) Promoting cell differentiation

364. Protoplast culture primarily focuses on:

a) Inducing leaf formation

b) Enhancing genetic variability

c) Producing genetically modified plants

d) Generating diploid plants

Answer: c) Producing genetically modified plants

365. The main challenge in protoplast culture is to ensure:

a) Decreased chromosome number

b) Proper fusion efficiency

c) Reduced cell viability

d) Reduced genetic variability

Answer: c) Reduced cell viability

366. The process of protoplast fusion primarily aims to:

a) Induce leaf formation

b) Reduce genetic variability

c) Facilitate plant regeneration

d) Increase chromosome number

Answer: c) Facilitate plant regeneration

367. What is a cybrid?

a) A genetically engineered animal

b) A cell containing a nucleus from one species and cytoplasm from another species

c) A plant produced through tissue culture

d) A hybrid resulting from the crossing of two different plant species

Answer: b) A cell containing a nucleus from one species and cytoplasm from another species

368. Which technology involves the creation of cybrids?

a) Tissue culture

b) Gene editing

c) Cloning

d) Cytoplasmic hybridization

Answer: d) Cytoplasmic hybridization

369. What is the primary objective of creating cybrids?

a) To develop disease-resistant plants

b) To enhance plant growth rate

c) To produce plants with specific desired traits

d) To create new species of plants

Answer: c) To produce plants with specific desired traits

370. In a cybrid, which component(s) come from different species?

a) Both the nucleus and cytoplasm
b) Only the nucleus
c) Only the cytoplasm
d) Neither the nucleus nor cytoplasm

Answer: a) Both the nucleus and cytoplasm

371. Which of the following techniques is used in creating a cybrid?

a) Fertilization of gametes
b) Fusion of protoplasts
c) Cross-breeding of plants
d) Exposure to radiation

Answer: b) Fusion of protoplasts

372. What advantage does cybrid technology offer in plant breeding?

a) Increased genetic variability
b) Enhanced disease susceptibility
c) Control over the transfer of specific cytoplasmic traits
d) Reduced growth rate

Answer: c) Control over the transfer of specific cytoplasmic traits

373. Which plant species has been widely studied using cybrid technology?

a) Arabidopsis thaliana
b) Tomato (Solanum lycopersicum)
c) Rice (Oryza sativa)
d) Maize (Zea mays)

Answer: c) Rice (Oryza sativa)

374. What is the significance of cybrids in agriculture?

a) They help in the development of genetically identical plant clones
b) They improve crop yields by increasing photosynthesis
c) They enhance resistance to environmental stress

d) They allow for the transfer of cytoplasmic traits without altering the nuclear genome

Answer: d) They allow for the transfer of cytoplasmic traits without altering the nuclear genome

375. How does cybrid technology contribute to crop improvement?

a) By altering the nuclear genome to introduce new traits
b) By solely focusing on enhancing cytoplasmic DNA
c) By enabling the transfer of cytoplasmic traits for desired characteristics
d) By increasing the size of plant cells

Answer: c) By enabling the transfer of cytoplasmic traits for desired characteristics

376. Which of the following is a limitation associated with cybrid technology?

a) Limited control over the transfer of specific traits
b) High cost of production
c) Incompatibility of cytoplasm from different species
d) Reduced plant vigor and growth rate

Answer: c) Incompatibility of cytoplasm from different species

377. The primary hormone used in protoplast fusion is for:

a) Inducing leaf senescence
b) Inhibiting cell division
c) Promoting cell differentiation
d) Preventing nutrient uptake

Answer: c) Promoting cell differentiation

378. The main advantage of protoplast fusion is:

a) Increased genetic variability
b) Reduced chromosome number
c) Enhanced cell wall development
d) Induction of leaf senescence

Answer: a) Increased genetic variability

379. What is somoclonal variation in plant tissue culture?

a) Variation due to somatic mutations occurring during tissue culture

b) Variation due to sexual reproduction

c) Variation from cell-to-cell communication

d) Variation in plant development due to environmental factors

Answer: a) Variation due to somatic mutations occurring during tissue culture

380. The primary cause of somoclonal variation is:

a) Genetic mutations during meiosis

b) Genetic mutations during mitosis in tissue culture

c) Chromosomal changes due to UV radiation

d) Changes in soil pH

Answer: b) Genetic mutations during mitosis in tissue culture

381. The term "somaclones" refers to:

a) Clones produced via sexual reproduction

b) Clones produced via asexual reproduction

c) Clones with somatic mutations

d) Clones with identical genetic makeup

Answer: c) Clones with somatic mutations

382. The primary application of somoclonal variation is:

a) Increasing seed production

b) Inducing genetic stability

c) Enhancing root development

d) Generating genetic diversity for crop improvement

Answer: d) Generating genetic diversity for crop improvement

383. The technique used to induce somoclonal variation is:

a) Hormone treatment

b) Mutation breeding

c) Chromosome doubling

d) Genome sequencing

Answer: b) Mutation breeding

384. The primary challenge in utilizing somoclonal variation is to:

a) Generate genetic uniformity

b) Enhance genetic stability

c) Reduce genetic diversity

d) Prevent genetic mutations

Answer: a) Generate genetic uniformity

385. The process of somoclonal variation leads to:

a) Uniformity in plant development

b) Increased genetic variability

c) Reduced yield in crops

d) Stable genetic traits

Answer: b) Increased genetic variability

386. The primary benefit of somoclonal variation is:

a) Genetic uniformity

b) Reduced genetic variability

c) Genetic diversity for crop improvement

d) Reduced mutation rates

Answer: c) Genetic diversity for crop improvement

387. The technique used to screen somoclonal variants is:

a) Genome sequencing

b) Field trials

c) Tissue culture microscopy

d) Hormonal treatments

Answer: b) Field trials

388. The primary goal of utilizing somoclonal variation is to:

a) Decrease crop yield

b) Enhance genetic diversity

c) Maintain uniformity in crops

d) Reduce plant susceptibility to diseases

Answer: b) Enhance genetic diversity

Artificial Seeds

389. What is a synthetic seed?

a) A genetically modified seed produced in a laboratory
b) A seed coated with synthetic chemicals for better germination
c) An artificial encapsulated structure containing a plant embryo or shoot-tip
d) A seed produced through traditional cross-breeding methods

Answer: c) An artificial encapsulated structure containing a plant embryo or shoot-tip

390. Which technique is used to produce synthetic seeds?

a) Tissue culture encapsulation
b) Genetic modification
c) Cross-pollination
d) Soil enrichment

Answer: a) Tissue culture encapsulation

391. What is the purpose of creating synthetic seeds?

a) To replace natural seeds in agriculture
b) To store seeds for an extended period without germination
c) To enable the mass production of genetically modified plants
d) To facilitate easy transportation and storage of valuable plant germplasm

Answer: d) To facilitate easy transportation and storage of valuable plant germplasm

392. Which part of the plant is encapsulated to create a synthetic seed?

a) Root
b) Stem
c) Shoot-tip or embryo
d) Leaves

Answer: c) Shoot-tip or embryo

393. What advantage do synthetic seeds offer in agriculture?

a) They reduce the need for soil preparation
b) They facilitate faster germination than natural seeds
c) They allow for the long-term storage and distribution of valuable plant material

d) They eliminate the need for water and sunlight during germination

Answer: c) They allow for the long-term storage and distribution of valuable plant material

394. Which plants are commonly propagated using synthetic seed technology?

a) Herbaceous plants
b) Woody plants
c) Cereal crops
d) All types of plants

Answer: a) Herbaceous plants

395. How are synthetic seeds similar to natural seeds?

a) They have a hard seed coat for protection
b) They contain a fully developed plant with roots, stem, and leaves
c) They have a high germination rate
d) They are encapsulated structures containing a plant embryo and stored food reserves

Answer: d) They are encapsulated structures containing a plant embryo and stored food reserves

396. What challenges are associated with synthetic seed technology?

a) Difficulty in transportation
b) Low germination rates
c) Limited availability of encapsulation materials
d) Incompatibility with tissue culture techniques

Answer: b) Low germination rates

397. Which specific industry benefits the most from synthetic seed technology?

a) Horticulture
b) Textile manufacturing
c) Information technology
d) Aerospace engineering

Answer: a) Horticulture

398. What potential advantage do synthetic seeds offer over traditional seeds in plant breeding programs?

a) Reduced diversity in plant genetic material
b) Faster growth and maturation of plants
c) Ease of handling and storage
d) Lower adaptability to diverse environmental conditions

Answer: c) Ease of handling and storage

399. What are artificial seeds in plant tissue culture?

a) Seeds produced by natural pollination
b) Seeds generated from synthetic chemicals
c) Encapsulated plant embryos or somatic embryos
d) Seeds modified through genetic engineering

Answer: c) Encapsulated plant embryos or somatic embryos

400. The primary material used for making artificial seeds is:

a) Plant tissue culture media
b) Synthetic fibers
c) Cellulose
d) Alginate or gelatin

Answer: d) Alginate or gelatin

401. The main advantage of artificial seeds is:

a) Lower cost in production
b) Increased genetic variability
c) Easy storage and transportation
d) Higher germination rates

Answer: c) Easy storage and transportation

402. The technique used to encapsulate embryos for artificial seeds is:

a) Microinjection
b) Somatic embryogenesis
c) Encapsulation in a gel matrix
d) Synthetic genetic modification

Answer: c) Encapsulation in a gel matrix

403. The primary challenge in utilizing artificial seeds is to:

a) Ensure genetic stability

b) Prevent seed germination

c) Achieve proper encapsulation and seed germination

d) Reduce genetic diversity

Answer: c) Achieve proper encapsulation and seed germination

404. The primary application of artificial seeds is in:

a) Plant breeding

b) Plant propagation

c) Enhancing root development

d) Genetic modification

Answer: b) Plant propagation

405. The process of artificial seed production involves:

a) Direct germination of embryos

b) Encapsulation of somatic embryos

c) Planting seeds in soil

d) Producing seeds through pollination

Answer: b) Encapsulation of somatic embryos

406. The primary benefit of using artificial seeds is:

a) Increased vulnerability to environmental stress

b) Higher susceptibility to diseases

c) Improved storage and handling

d) Reduced seed viability

Answer: c) Improved storage and handling

407. The technique used for encapsulating embryos involves:

a) Micrografting

b) Immobilization in a gel matrix

c) Chromosome doubling

d) Genome sequencing

Answer: b) Immobilization in a gel matrix

408. The primary goal of artificial seeds is to:

a) Enhance genetic diversity

b) Reduce seed germination rates

c) Improve seed storage and handling

d) Increase plant susceptibility to diseases

Answer: c) Improve seed storage and handling

409. What is hardening in plant tissue culture?

a) Strengthening of plant tissues through genetic modification

b) Adjustment of plant growth in harsh environmental conditions

c) Acclimatization of tissue-cultured plants to ex vitro conditions

d) Reducing genetic variability in tissue-cultured plants

Answer: c) Acclimatization of tissue-cultured plants to ex vitro conditions

410. The primary purpose of hardening is to:

a) Weaken plant tissues

b) Enhance plant growth in tissue culture

c) Adapt tissue-cultured plants to natural conditions

d) Increase genetic variability in plants

Answer: c) Adapt tissue-cultured plants to natural conditions

411. The main challenge in the hardening process is to:

a) Reduce genetic variability

b) Enhance seed germination rates

c) Acclimate tissue-cultured plants to natural conditions

d) Maintain tissue-cultured plants in vitro

Answer: c) Acclimate tissue-cultured plants to natural conditions

412. The technique used in hardening tissue-cultured plants involves:

a) Increasing aeration in the culture vessel

b) Gradual exposure to environmental factors

c) Genetic modification of plants

d) Reducing nutrient supply to plants

Answer: b) Gradual exposure to environmental factors

413. The primary benefit of hardening tissue-cultured plants is:

a) Reduced adaptability to natural conditions

b) Improved tissue culture growth

c) Enhanced resistance to diseases

d) Reduced seed viability

Answer: c) Enhanced resistance to diseases

414. The process of hardening involves the gradual:

a) Transfer of tissue-cultured plants to harsh conditions

b) Increase in nutrient supply to tissue-cultured plants

c) Reduction in temperature for tissue-cultured plants

d) Exposure of tissue-cultured plants to favorable conditions

Answer: a) Transfer of tissue-cultured plants to harsh conditions

415. The primary technique used to enhance hardening in tissue-cultured plants is:

a) Increasing humidity levels

b) Reducing light exposure

c) Sudden temperature changes

d) Gradual adaptation to environmental conditions

Answer: d) Gradual adaptation to environmental conditions

416. The main challenge in hardening tissue-cultured plants is to:

a) Maintain plants in vitro conditions

b) Increase genetic variability

c) Adapt plants to external conditions

d) Reduce plant susceptibility to diseases

Answer: c) Adapt plants to external conditions

417. The technique used for hardening tissue-cultured plants involves:

a) Sudden exposure to harsh environmental conditions

b) Gradual exposure to natural conditions

c) Genetic modification of plants

d) Reducing nutrient supply to plants

Answer: b) Gradual exposure to natural conditions

418. The primary goal of hardening tissue-cultured plants is to:

a) Increase seed germination rates

b) Reduce genetic variability

c) Acclimate plants to ex vitro conditions

d) Weaken plant tissues

Answer: c) Acclimate plants to ex vitro conditions

Ti and Ri Plasmids:

419. What are Ti and Ri plasmids primarily associated with?

a) Fungal infections

b) Bacterial infections

c) Animal diseases

d) Human viral diseases

Answer: b) Bacterial infections

420. Ti and Ri plasmids are commonly found in:

a) Escherichia coli

b) Agrobacterium species

c) Pseudomonas species

d) Salmonella species

Answer: b) Agrobacterium species

421. The primary function of Ti and Ri plasmids is to:

a) Promote tumor formation in animals

b) Induce root formation in plants

c) Enhance bacterial growth

d) Cause diseases in insects

Answer: b) Induce root formation in plants

422. Ti and Ri plasmids are known for their ability to cause:

a) Cancer in animals

b) Bacterial infections in humans

c) Crown gall disease in plants

d) Malaria in insects

Answer: c) Crown gall disease in plants

423. The process by which Ti and Ri plasmids transfer genetic material into plant cells is called:

a) Conjugation

b) Transduction

c) Transformation

d) Transfection

Answer: c) Transformation

424. The genes responsible for the transfer of Ti and Ri plasmids into plant cells are located in the:

a) T-DNA (Transfer DNA)

b) Bacterial genome

c) Chromosomal DNA of plants

d) P-DNA (Plasmid DNA)

Answer: a) T-DNA (Transfer DNA)

425.The phenomenon where the T-DNA integrates into the plant genome is known as:

a) Transposon movement

b) Plasmid replication

c) T-DNA insertion

d) Genomic rearrangement

Answer: c) T-DNA insertion

426.. Ti and Ri plasmids encode for the production of:

a) Auxins and cytokinins

b) Ethylene and gibberellins

c) Abscisic acid and jasmonic acid

d) Salicylic acid and indole acetic acid

Answer: a) Auxins and cytokinins

427. The ability of Ti and Ri plasmids to cause crown gall disease is attributed to the production of:

a) Ethylene

b) Auxins

c) Cytokinins

d) Abscisic acid

Answer: b) Auxins

428. The primary plant hormone synthesized by Ti and Ri plasmids to induce root formation is:

a) Auxin

b) Ethylene

c) Gibberellins

d) Cytokinins

Answer: a) Auxin

429. The genes responsible for the biosynthesis of auxins and cytokinins are located in the:

a) Vir region

b) Opine region

c) T-DNA region

d) Replication region

Answer: c) T-DNA region

430. The main feature that distinguishes Ti and Ri plasmids is their:

a) Size

b) Coloration

c) Location in the host cell

d) Ability to infect humans

Answer: a) Size

431. The genes responsible for opine production in Ti and Ri plasmids are located in the:

a) Vir region

b) Opine region

c) T-DNA region

d) Replication region

Answer: b) Opine region

432. The opines produced by Ti and Ri plasmids serve as:

a) Essential nutrients for bacteria

b) Repressors of bacterial growth

c) Indicators of plant stress

d) Signaling molecules for bacterial communication

Answer: a) Essential nutrients for bacteria

433. The phenomenon of opine synthesis is associated with:

a) Plant resistance to pathogens

b) Bacterial quorum sensing

c) Plant transpiration

d) Bacterial transformation

Answer: a) Plant resistance to pathogens

434. The process by which Ti and Ri plasmids are transferred between bacterial cells is called:

a) Conjugation

b) Transformation

c) Transduction

d) Transfection

Answer: a) Conjugation

435. The primary method used to introduce Ti and Ri plasmids into plant cells for genetic modification is:

a) Electroporation

b) Microinjection

c) Agrobacterium-mediated transformation

d) Lipofection

Answer: c) Agrobacterium-mediated transformation

436. The part of Ti and Ri plasmids that facilitates their transfer into plant cells is called the:

a) Vir region

b) Opine region

c) T-DNA region

d) Replication region

Answer: a) Vir region

437. The process that initiates Ti and Ri plasmid transfer to plant cells is triggered by:

a) Plant hormone production

b) Plant pathogen invasion

c) Plant wound signals

d) Plant photosynthesis

Answer: c) Plant wound signals

438. The primary method used to analyze Ti and Ri plasmid transfer and integration into plant cells is:

a) PCR (Polymerase Chain Reaction)

b) Southern blotting

c) Northern blotting

d) ELISA (Enzyme-Linked Immunosorbent Assay)

Answer: b) Southern blotting

439. Ti and Ri plasmids are naturally found in which genus of bacteria?

a) Escherichia

b) Agrobacterium

c) Streptomyces

d) Bacillus

Answer: b) Agrobacterium

440. The genes responsible for opine utilization in Ti and Ri plasmids are located in the:

a) Vir region

b) Opine region

c) T-DNA region

d) Replication region

Answer: a) Vir region

441. The term "crown gall disease" is caused by Ti and Ri plasmids in:

a) Fruit crops

b) Leguminous plants

c) Trees

d) Herbaceous plants

Answer: d) Herbaceous plants

442. The site of Ti and Ri plasmid insertion in the plant genome is determined by:

a) Bacterial factors

b) Plant factors

c) Environmental conditions

d) Host defense mechanisms

Answer: b) Plant factors

443. The genes for tumor induction by Ti and Ri plasmids are located in the:

a) Vir region

b) Opine region

c) T-DNA region

d) Replication region

Answer: c) T-DNA region

444. The virulence genes in Ti and Ri plasmids encode proteins involved in:

a) Auxin production

b) Root formation

c) Opine synthesis

d) DNA transfer to plant cells

Answer: d) DNA transfer to plant cells

445. The opines produced by Ti and Ri plasmids are utilized by bacteria as:

a) Carbon sources

b) Nitrogen sources

c) Energy sources

d) Signal molecules

Answer: a) Carbon sources

446. The ability of Ti and Ri plasmids to induce root formation is attributed to the production of:

a) Auxins

b) Cytokinins

c) Gibberellins

d) Ethylene

Answer: a) Auxins

447. Ti and Ri plasmids can be transferred to plant cells through:

a) Direct gene transfer

b) Cell fusion

c) Electroporation

d) Conjugation with Agrobacterium

Answer: d) Conjugation with Agrobacterium

448. The integration of Ti and Ri plasmids into plant genomes occurs via:

a) Homologous recombination

b) Site-specific recombination

c) Random insertion

d) Nucleotide substitution

Answer: b) Site-specific recombination

449. The plant tissues most susceptible to Ti and Ri plasmid-mediated transformation are:

a) Mature leaves

b) Shoot apical meristems

c) Root tips

d) Stem nodes

Answer: b) Shoot apical meristems

450. The opine utilization genes of Ti and Ri plasmids allow bacteria to:

a) Absorb more light

b) Utilize opines as carbon and nitrogen sources

c) Increase bacterial cell size

d) Increase bacterial motility

Answer: b) Utilize opines as carbon and nitrogen sources

451. The genes responsible for the virulence of Ti and Ri plasmids are regulated by:

a) Quorum sensing

b) External factors like temperature

c) Light intensity

d) Soil pH

Answer: a) Quorum sensing

452. Ti and Ri plasmids are maintained within bacterial populations due to:

a) Repression of opine synthesis

b) Activation of T-DNA transfer

c) Selection for virulent strains

d) Selection for opine utilization

Answer: d) Selection for opine utilization

453. The process by which Agrobacterium infects plants involves:

a) Penetration through the plant cell wall

b) Invasion through stomata

c) Conjugation with plant cells

d) Secretion of virulence factors

Answer: d) Secretion of virulence factors

454. The opine utilization genes enable bacteria to:

a) Compete with other microorganisms

b) Break down plant cell walls

c) Produce antibiotics

d) Withstand harsh environmental conditions

Answer: a) Compete with other microorganisms

455. The genes involved in T-DNA transfer are regulated by:

a) Environmental factors

b) Plant hormonal signals

c) Bacterial quorum sensing

d) Opine synthesis

Answer: c) Bacterial quorum sensing

456. The transformation process mediated by Ti and Ri plasmids is:

a) Random and unspecific

b) Highly specific to certain plant species

c) Influenced by bacterial motility

d) Dependent on soil pH

Answer: b) Highly specific to certain plant species

457. The T-DNA in Ti and Ri plasmids is flanked by:

a) Virulence genes

b) Opine synthesis genes

c) Border sequences

d) Transposons

Answer: c) Border sequences

458. The opine utilization genes in Ti and Ri plasmids are controlled by:

a) Host plant signals

b) Bacterial quorum sensing

c) Soil moisture

d) Nitrogen availability

Answer: b) Bacterial quorum sensing

459. The introduction of Ti and Ri plasmids into plant cells results in:

a) Increased pathogen susceptibility

b) Genetic stability

c) Expression of bacterial traits in plants

d) Increased resistance to diseases

Answer: c) Expression of bacterial traits in plants

460. The genes involved in opine synthesis in Ti and Ri plasmids are activated by:

a) Plant defense signals

b) Bacterial cell wall degradation

c) Bacterial chromosomal mutations

d) Plant wound signals

Answer: d) Plant wound signals

461. The primary function of the Vir region in Ti and Ri plasmids is to:

a) Initiate T-DNA transfer

b) Synthesize opines

c) Replicate the plasmids

d) Induce crown gall formation

Answer: a) Initiate T-DNA transfer

462. The site-specific recombination in Ti and Ri plasmids is mediated by:

a) Virulence factors

b) VirD2 protein

c) VirE2 protein

d) VirB protein

Answer: b) VirD2 protein

463. The opines produced by Ti and Ri plasmids serve as:

a) Antimicrobial agents

b) Growth regulators

c) Nutrient sources

d) Signal molecules

Answer: c) Nutrient sources

464. The transfer of Ti and Ri plasmids into plant cells occurs through:

a) Plasmid uptake by endocytosis

b) Cell-to-cell contact with bacteria

c) Passive diffusion of plasmids

d) Translocation through phloem

Answer: b) Cell-to-cell contact with bacteria

465. The expression of T-DNA genes in Ti and Ri plasmids is regulated by:

a) Opine concentrations

b) Plant stress signals

c) Bacterial host range

d) Plant pathogen resistance

Answer: a) Opine concentrations

466. The process by which opine utilization genes in Ti and Ri plasmids are activated is:

a) Quorum sensing

b) Activation by T-DNA transfer

c) Induction by plant stress

d) Expression by bacterial flagella

Answer: a) Quorum sensing

467. The genes involved in opine synthesis in Ti and Ri plasmids are activated by:

a) Plant defense signals

b) Bacterial cell wall degradation

c) Bacterial chromosomal mutations

d) Plant wound signals

Answer: d) Plant wound signals

468. The primary purpose of Ti and Ri plasmids in Agrobacterium is to:

a) Enhance bacterial growth rate

b) Promote bacterial conjugation

c) Infect and genetically modify plant cells

d) Increase bacterial motility

Answer: c) Infect and genetically modify plant cells

469. Binary vector systems in plant transformation involve the presence of:

a) Single plasmid

b) Two plasmids

c) Three plasmids

d) Multiple chromosomes

Answer: b) Two plasmids

470. The essential components in a binary vector system typically include:

a) T-DNA and Vir genes on the same plasmid

b) T-DNA and Vir genes on separate plasmids

c) T-DNA and Rep genes on the same plasmid

d) T-DNA and Rep genes on separate plasmids

Answer: b) T-DNA and Vir genes on separate plasmids

471. Co-integrated vector systems involve the fusion of:

a) Two T-DNA regions

b) Two Vir regions

c) T-DNA and Vir regions

d) T-DNA and Rep genes

Answer: a) Two T-DNA regions

472. The primary advantage of using a binary vector system is:

a) Higher transformation efficiency

b) Lower stability of genetic material

c) Limited gene expression

d) Difficulty in plant integration

Answer: a) Higher transformation efficiency

473. In a binary vector system, the virulence (Vir) genes are responsible for:

a) Gene expression in plant cells

b) T-DNA integration into the plant genome

c) Promoting bacterial conjugation

d) Recognition of the plant host

Answer: d) Recognition of the plant host

474. Co-integrated vector systems involve the integration of T-DNA regions into:

a) Chromosomal DNA

b) Plasmid DNA

c) Mitochondrial DNA

d) Nuclear DNA

Answer: b) Plasmid DNA

475. The main advantage of using a co-integrated vector system is:

a) Lower transformation efficiency

b) Enhanced stability of genetic material

c) Reduced T-DNA delivery

d) Unstable integration into the plant genome

Answer: b) Enhanced stability of genetic material

476. In a binary vector system, the plasmid containing the T-DNA lacks:

a) Vir genes

b) Rep genes

c) Selectable markers

d) Antibiotic resistance genes

Answer: a) Vir genes

477. The co-integration of T-DNA regions in co-integrated vectors occurs through:

a) Site-specific recombination

b) Homologous recombination

c) Random integration

d) Transposon insertion

Answer: b) Homologous recombination

478. The purpose of using a selectable marker in a binary vector system is to:

a) Isolate T-DNA from plasmid DNA

b) Ensure stability of T-DNA

c) Screen and identify transformed cells

d) Reduce bacterial growth

Answer: c) Screen and identify transformed cells

479. Co-integrated vector systems enhance stability by:

a) Facilitating T-DNA release

b) Increasing antibiotic resistance

c) Linking T-DNA to the bacterial chromosome

d) Lowering transformation efficiency

Answer: c) Linking T-DNA to the bacterial chromosome

480. The key component that differentiates binary and co-integrated vector systems is:

a) T-DNA structure

b) Replication origin

c) Integration mechanism

d) Antibiotic resistance genes

Answer: c) Integration mechanism

481. Binary vector systems consist of two plasmids: one with T-DNA and another with:

a) Antibiotic resistance genes

b) Vir genes

c) Replication origin

d) Selectable markers

Answer: b) Vir genes

482. Co-integrated vector systems improve genetic stability by reducing:

a) Plasmid copy numbers

b) T-DNA integration

c) Antibiotic selection

d) T-DNA size

Answer: a) Plasmid copy numbers

483. The main function of the Vir genes in binary vector systems is to:

a) Initiate bacterial conjugation

b) Enhance antibiotic resistance

c) Promote T-DNA transfer to plant cells

d) Suppress plant immunity

Answer: c) Promote T-DNA transfer to plant cells

484. Co-integrated vector systems offer advantages in:

a) Lower transformation efficiency

b) Reduced plasmid stability

c) Higher T-DNA delivery

d) Instability in bacterial culture

Answer: c) Higher T-DNA delivery

485. Binary vector systems commonly use which technique for selecting transformed cells?

a) Southern blotting

b) Polymerase Chain Reaction (PCR)

c) Antibiotic selection

d) Electroporation

Answer: c) Antibiotic selection

486. Co-integrated vector systems usually result in:

a) Unstable T-DNA integration

b) Single T-DNA copy integration

c) High transformation efficiency

d) Antibiotic resistance loss

Answer: b) Single T-DNA copy integration

487. The selectable marker in binary vector systems is often linked to the:

a) Replication origin

b) Virulence genes

c) T-DNA border sequences

d) Antibiotic resistance gene

Answer: d) Antibiotic resistance gene

488. Co-integrated vector systems enhance stability by reducing:

a) Plasmid copy numbers

b) T-DNA integration

c) Antibiotic selection

d) T-DNA size

Answer: a) Plasmid copy numbers

489. The integration of T-DNA into plant cells in binary systems is facilitated by:

a) Vir genes

b) Rep genes

c) Selectable markers

d) Replication origin

Answer: a) Vir genes

490. Co-integrated vector systems provide advantages in terms of:

a) Increased plasmid instability

b) Higher T-DNA loss

c) Enhanced plant transformation

d) Reduced T-DNA stability

Answer: c) Enhanced plant transformation

491. The primary difference between binary and co-integrated systems is in their:

a) T-DNA structure

b) Integration mechanism

c) Replication origin

d) Antibiotic resistance genes

Answer: b) Integration mechanism

492. The purpose of the rep genes in binary vector systems is to:

a) Facilitate T-DNA integration

b) Replicate T-DNA in plant cells

c) Ensure plasmid stability

d) Enhance antibiotic resistance

Answer: c) Ensure plasmid stability

493. Co-integrated vector systems improve genetic stability by reducing:

a) Plasmid copy numbers

b) T-DNA integration

c) Antibiotic selection

d) T-DNA size

Answer: a) Plasmid copy numbers

494. Which type of viruses are commonly used as vectors in gene therapy?

a) Bacteriophages

b) Retroviruses

c) Fungi viruses

d) Plant viruses

Answer: b) Retroviruses

495. What is the primary function of a viral vector in gene therapy?

a) Inducing immune responses

b) Carrying and delivering genes into target cells

c) Disrupting cellular processes

d) Triggering apoptosis in cells

Answer: b) Carrying and delivering genes into target cells

496. Which viral vector is known for its ability to infect both dividing and non-dividing cells?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: c) Lentivirus

497. Which viral vector often causes a transient expression of the transgene in host cells?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: a) Adenovirus

498. What is the main limitation of adenoviral vectors in gene therapy?

a) Low transduction efficiency

b) Inability to integrate into the host genome

c) Limited cargo capacity

d) High immunogenicity

Answer: b) Inability to integrate into the host genome

499. Which viral vector has a relatively larger cargo capacity among commonly used vectors?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: d) Herpesvirus

500. Retroviral vectors integrate their genetic material into the host genome via:

a) Homologous recombination

b) Non-homologous end joining

c) Site-specific recombination

d) Retrotransposition

Answer: d) Retrotransposition

501. Which viral vector is often used for long-term gene expression due to its ability to integrate into the host genome?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: b) Retrovirus

502. In gene therapy, which viral vector is commonly used for targeting the central nervous system?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: d) Herpesvirus

503. What is the major advantage of using viral vectors in gene therapy compared to non-viral vectors?

a) Lower immune response

b) Larger cargo capacity

c) Less cytotoxicity

d) Higher transduction efficiency

Answer: d) Higher transduction efficiency

504. Which viral vector system has been successfully employed in CAR-T cell therapy?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: c) Lentivirus

505. Which viral vector has shown potential in vaccine development due to its ability to express antigen proteins in target cells?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: a) Adenovirus

506. What is the most common method used to produce viral vectors for gene therapy?

a) Isolation from infected animals

b) Chemical synthesis

c) In vitro assembly

d) Molecular cloning techniques

Answer: d) Molecular cloning techniques

507. The capacity of viral vectors to infect a wide range of cell types is known as:

a) Transgene expression

b) Transduction efficiency

c) Tropism

d) Immune response

Answer: c) Tropism

508. Which viral vector is commonly used in cancer gene therapy due to its relatively low pathogenicity?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: c) Lentivirus

509. The process by which viral vectors are modified to reduce immunogenicity is called:

a) Vector integration

b) Vector tropism

c) Vector shielding

d) Vector pseudotyping

Answer: d) Vector pseudotyping

510. Which viral vector exhibits the ability to infect both dividing and non-dividing cells without integrating into the host genome?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: a) Adenovirus

511. Viral vectors used in gene therapy typically deliver genes via:

a) Endocytosis

b) Phagocytosis

c) Receptor-mediated mechanisms

d) Passive diffusion

Answer: c) Receptor-mediated mechanisms

512. The main challenge associated with using viral vectors in gene therapy is:

a) Low transduction efficiency

b) Difficulty in vector production

c) Risk of insertional mutagenesis

d) Limited cargo capacity

Answer: c) Risk of insertional mutagenesis

513. Which viral vector is well-suited for delivering genes into rapidly dividing cells, such as in cancer therapy?

a) Adenovirus

b) Retrovirus

c) Lentivirus

d) Herpesvirus

Answer: b) Retrovirus

514. The Cauliflower Mosaic Virus (CaMV) 35S promoter is commonly used in plant vectors due to its:

a) Specificity to monocots

b) High constitutive activity

c) Selective expression in roots

d) Low transcription efficiency

Answer: b) High constitutive activity

515. The 35S promoter in plant vectors originates from:

a) Arabidopsis thaliana

b) Cauliflower Mosaic Virus

c) Tobacco mosaic virus

d) Rice blast fungus

Answer: b) Cauliflower Mosaic Virus

516. Which of the following is a characteristic feature of the 35S promoter?

a) Weak transcription initiation

b) Tissue-specific expression

c) High transcriptional activity

d) Limited response to environmental cues

Answer: c) High transcriptional activity

517. The 35S promoter is typically active in which part(s) of the plant?

a) Roots only

b) Leaves and stems

c) Flowers only

d) All plant tissues

Answer: d) All plant tissues

518. Which of these promoters is known for its tissue-specific expression, particularly in phloem tissues?

a) 35S promoter

b) Ubiquitin promoter

c) Actin promoter

d) SUC2 promoter

Answer: d) SUC2 promoter

519. The SUC2 promoter is derived from which plant species?

a) Arabidopsis thaliana

b) Cauliflower

c) Tomato

d) Tobacco

Answer: a) Arabidopsis thaliana

520. The SUC2 promoter drives gene expression primarily in:

a) Roots

b) Leaves

c) Flowers

d) Stems

Answer: a) Roots

521. The Nos (nopaline synthase) promoter is derived from which organism?

a) Bacteria

b) Fungi

c) Algae

d) Virus

Answer: a) Bacteria

522. The Nos promoter is frequently used in plant vectors due to its:

a) High transcriptional activity

b) Specificity to monocots

c) Resistance to environmental changes

d) Selective expression in leaves

Answer: a) High transcriptional activity

523. Which of these promoters is commonly used for gene expression in monocotyledonous plants?

a) CaMV 35S

b) UBQ10

c) Zein

d) Actin

Answer: c) Zein

524. The UBQ10 promoter is known for its:

a) Specific expression in roots

b) High constitutive activity

c) Exclusive expression in flowers

d) Low transcriptional efficiency

Answer: b) High constitutive activity

525. The ZmUbi1 promoter is derived from:

a) Rice

b) Maize

c) Wheat

d) Barley

Answer: b) Maize

526. The ZmUbi1 promoter is commonly used due to its:

a) Low activity in leaves

b) Specific expression in roots

c) High constitutive activity

d) Resistance to biotic stress

Answer: c) High constitutive activity

527. Which of these promoters is known for its ability to drive strong gene expression in cereal crops?

a) UBQ10

b) CaMV 35S

c) ZmUbi1

d) Nos

Answer: c) ZmUbi1

528. The Actin promoter is recognized for its expression primarily in:

a) Leaves

b) Stems

c) Roots

d) Flowers

Answer: a) Leaves

529. Which of these promoters is often used for driving gene expression in dicotyledonous plants?

a) UBQ10

b) Actin

c) Zein

d) SUC2

Answer: b) Actin

530. The UBQ10 promoter is derived from which plant species?

a) Arabidopsis thaliana

b) Rice

c) Maize

d) Tomato

Answer: a) Arabidopsis thaliana

531. The UBQ10 promoter drives gene expression mainly in which plant part(s)?

a) Roots

b) Leaves

c) Flowers

d) Stems

Answer: b) Leaves

532. The enhanced activity of the 35S promoter is attributed to its:

a) Conserved structure

b) Regulatory elements

c) Resistance to abiotic stress

d) Limited expression in leaves

Answer: b) Regulatory elements

533. The 35S promoter is commonly used as a(n) _____ promoter in plant biotechnology.

a) Tissue-specific

b) Inducible

c) Constitutive

d) Root-specific

Answer: c) Constitutive

534.Which of the following is used as a selectable genetic marker in most plant transformation studies?

a) β-galactosidase

b) Green fluorescent protein (GFP)

c) Antibiotic resistance genes

d) Luciferase

Answer: c) Antibiotic resistance genes

535. Reporter genes are used primarily for:

a) Selecting transformed cells

b) Quantifying gene expression

c) Enhancing transformation efficiency

d) Improving plant growth

Answer: b) Quantifying gene expression

536. The GUS gene, commonly used as a reporter gene, encodes the enzyme:

a) Glutathione peroxidase

b) β-glucuronidase

c) Glutathione S-transferase

d) β-galactosidase

Answer: b) β-glucuronidase

537. In plant transformation, the role of virulence genes from Agrobacterium is to:

a) Facilitate antibiotic resistance

b) Enhance plant growth

c) Transfer T-DNA to host cells

d) Increase plant immunity

Answer: c) Transfer T-DNA to host cells

538. The primary function of a cloning vector in genetic engineering is to:

a) Integrate into the host genome

b) Transfer genes between organisms

c) Produce large quantities of protein

d) Carry and replicate foreign DNA

Answer: d) Carry and replicate foreign DNA

539. Plasmids are commonly used as cloning vectors due to their:

a) Inability to carry foreign DNA

b) Small size and ease of manipulation

c) Limited capacity for DNA insertion

d) Requirement for integration into the host genome

Answer: b) Small size and ease of manipulation

540. In recombinant DNA technology, DNA ligase is used to:

a) Cut DNA at specific sites

b) Join DNA fragments together

c) Amplify specific DNA sequences

d) Transfer DNA into host cells

Answer: b) Join DNA fragments together

541.. Restriction enzymes are employed in cloning strategies to:

a) Amplify DNA fragments

b) Synthesize RNA from DNA templates

c) Cut DNA at specific recognition sites

d) Integrate foreign DNA into host cells

Answer: c) Cut DNA at specific recognition sites

542. The PCR technique in cloning helps to:

a) Amplify specific DNA sequences

b) Cut DNA at specific sites

c) Join DNA fragments together

d) Insert foreign DNA into host cells

Answer: a) Amplify specific DNA sequences

543. The technique used to introduce foreign DNA into plant cells involves:

a) PCR

b) Electroporation

c) Western blotting

d) Agrobacterium-mediated transformation

Answer: d) Agrobacterium-mediated transformation

544. A selectable marker gene in genetic engineering is crucial for:

a) Monitoring gene expression

b) Identifying transformed cells

c) Enhancing antibiotic resistance

d) Inactivating virulence genes

Answer: b) Identifying transformed cells

545. In Agrobacterium-mediated transformation, the virulence genes help in:

a) Amplifying T-DNA

b) Cutting foreign DNA

c) Transferring T-DNA into host cells

d) Enhancing antibiotic resistance

Answer: c) Transferring T-DNA into host cells

546. In cloning vectors, an origin of replication is essential for:

a) Inserting foreign DNA

b) Expressing reporter genes

c) Replicating DNA in host cells

d) Cutting DNA at specific sites

Answer: c) Replicating DNA in host cells

547. The term "blue-white screening" is associated with the identification of:

a) Cloned DNA fragments

b) Recombinant plasmids

c) Selectable marker genes

d) Reporter gene expression

Answer: b) Recombinant plasmids

548. Transgenic plants are generated through the introduction of:

a) Reporter genes

b) Selectable marker genes

c) Virulence genes

d) Antibiotic resistance genes

Answer: b) Selectable marker genes

549. The use of the CaMV 35S promoter in cloning vectors helps in:

a) Antibiotic resistance

b) T-DNA transfer

c) Enhancing transgene expression

d) Replicating DNA in host cells

Answer: c) Enhancing transgene expression

550. The term "ligation" in molecular biology refers to:

a) Cutting DNA at specific sites

b) Joining DNA fragments together

c) Introducing foreign DNA into host cells

d) Amplifying DNA sequences

Answer: b) Joining DNA fragments together

551. In plant transformation, the use of selection agents like antibiotics aids in:

a) Enhancing gene expression

b) Reducing T-DNA transfer

c) Identifying transformed cells

d) Inactivating reporter genes

Answer: c) Identifying transformed cells

552. The Ti plasmid in Agrobacterium tumefaciens is associated with:

a) Virulence genes

b) Reporter genes

c) Antibiotic resistance genes

d) Cloning strategies

Answer: a) Virulence genes

553. The function of a reporter gene in cloning is to:

a) Enhance antibiotic resistance

b) Cut foreign DNA

c) Monitor gene expression

d) Transfer T-DNA into host cells

Answer: c) Monitor gene expression

554. Which of the following is a direct DNA transfer method used for plant transformation?

a) Electroporation

b) Particle bombardment

c) Protoplast fusion

d) Microinjection

Answer: b) Particle bombardment

555. The method involving the use of DNA-coated microscopic particles accelerated into plant cells is called:

a) Electroporation

b) Protoplast fusion

c) Microinjection

d) Biolistics or particle bombardment

Answer: d) Biolistics or particle bombardment

556. Which direct DNA transfer method uses an electric field to create temporary pores in plant cell membranes for DNA entry?

a) Particle bombardment

b) Microinjection

c) Electroporation

d) Protoplast fusion

Answer: c) Electroporation

557. The gene transfer method involving the fusion of plant protoplasts to introduce foreign DNA is known as:

a) Electroporation

b) Protoplast fusion

c) Particle bombardment

d) Microinjection

Answer: b) Protoplast fusion

558. Agrobacterium-mediated transformation primarily involves the transfer of foreign DNA into plant cells via:

a) Electroporation

b) Protoplast fusion

c) Microinjection

d) Tumor-inducing (Ti) plasmid

Answer: d) Tumor-inducing (Ti) plasmid

559. Which component of Agrobacterium tumefaciens facilitates the transfer of T-DNA into plant cells?

a) VirD protein

b) VirE protein

c) VirB protein complex

d) VirC protein

Answer: c) VirB protein complex

560. The T-DNA region in Agrobacterium tumefaciens contains genes responsible for:

a) Bacterial conjugation

b) Plant transformation

c) Antibiotic resistance

d) Host recognition

Answer: b) Plant transformation

561. The transfer of T-DNA into plant cells by Agrobacterium involves:

a) Passive diffusion

b) Active transport

c) Endocytosis

d) Type IV secretion system

Answer: d) Type IV secretion system

562. Which plant transformation method relies on the use of wound sites for efficient DNA transfer?

a) Electroporation

b) Protoplast fusion

c) Agrobacterium-mediated transformation

d) Particle bombardment

Answer: c) Agrobacterium-mediated transformation

563. Which of the following elements in the Ti plasmid is responsible for the transfer of T-DNA into plant cells?

a) VirE

b) VirC

c) VirD

d) VirB

Answer: d) VirB

564. In Agrobacterium-mediated transformation, the DNA transfer occurs through the formation of a structure called:

a) Plasmodesma

b) Conjugation tube

c) Endosome

d) VirB channel

Answer: d) VirB channel

565. Which of the following plant species is commonly used for Agrobacterium-mediated transformation?

a) Arabidopsis thaliana

b) Escherichia coli

c) Saccharomyces cerevisiae

d) Nicotiana tabacum

Answer: d) Nicotiana tabacum

567. The process of preparing wounded plant tissue for efficient Agrobacterium-mediated transformation is referred to as:

a) Callus induction

b) Co-cultivation

c) Transformation efficiency

d) Inoculation

Answer: b) Co-cultivation

568. Which gene present in the T-DNA region of the Ti plasmid is often replaced with the gene of interest in Agrobacterium-mediated transformation?

a) VirE

b) VirC

c) VirD

d) Selectable marker

Answer: d) Selectable marker

569. Which of the following is a critical step in the Agrobacterium-mediated transformation protocol to facilitate efficient DNA transfer?

a) Regeneration of plants

b) Integration of the Ti plasmid

c) Virulence gene knockout

d) Co-cultivation of bacteria and plant tissue

Answer: d) Co-cultivation of bacteria and plant tissue

570. Which application of plant genetic engineering involves modifying crops to resist specific herbicides?

a) Disease resistance

b) Insect resistance

c) Herbicide resistance

d) Stress tolerance

Answer: c) Herbicide resistance

571.Genetic modification in crops to express proteins toxic to insects, reducing the need for chemical pesticides, is known as:

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Stress tolerance

Answer: c) Insect resistance

572. Enhancing crops' ability to tolerate adverse environmental conditions like drought and salinity involves:

a) Disease resistance

b) Insect resistance

c) Herbicide resistance

d) Abiotic stress tolerance

Answer: d) Abiotic stress tolerance

573 The application of genetic engineering aiming to improve crop nutritional content is known as:

a) Biofortification

b) Disease resistance

c) Insect resistance

d) Herbicide resistance

Answer: a) Biofortification

574. Which application of plant genetic engineering involves delaying the ripening of fruits to prolong their shelf life?

a) Disease resistance

b) Insect resistance

c) Delayed ripening

d) Abiotic stress tolerance

Answer: c) Delayed ripening

575. What is the primary objective of genetically engineered crops resistant to various diseases caused by viruses, fungi, and bacteria?

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Abiotic stress tolerance

Answer: b) Disease resistance

576. Genetic modification aiming to enhance the yield and efficiency of resource utilization in crops focuses primarily on:

a) Enhanced nutritional content

b) Increased shelf life

c) Increased yield

d) Insect resistance

Answer: c) Increased yield

577. The process of enriching crops with essential nutrients through genetic modification to improve public health is called:

a) Herbicide resistance

b) Disease resistance

c) Biofortification

d) Abiotic stress tolerance

Answer: c) Biofortification

578.Genetic engineering that enhances crops' ability to withstand specific herbicides is referred to as:

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Abiotic stress tolerance

Answer: a) Herbicide resistance

579. Improving crop tolerance to harsh environmental conditions, such as extreme temperatures, falls under:

a) Increased yield

b) Abiotic stress tolerance

c) Environmental sustainability

d) Disease resistance

Answer: b) Abiotic stress tolerance

580. The development of crops expressing proteins toxic to specific insects, reducing reliance on pesticides, is known as:

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Abiotic stress tolerance

Answer: c) Insect resistance

581. Which genetic modification application aims to enhance crops' ability to withstand adverse environmental conditions like drought and salinity?

a) Increased yield

b) Abiotic stress tolerance

c) Environmental sustainability

d) Disease resistance

Answer: b) Abiotic stress tolerance

582. The process of enriching crops with essential vitamins and nutrients to combat malnutrition is called:

a) Herbicide resistance

b) Disease resistance

c) Biofortification

d) Insect resistance

Answer: c) Biofortification

583. What does genetically engineered delayed ripening in fruits aim to achieve primarily?

a) Enhanced taste

b) Improved aroma

c) Extended shelf life

d) Reduced size

Answer: c) Extended shelf life

584. The development of crops resistant to various pathogens, including viruses and fungi, primarily targets:

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Abiotic stress tolerance

Answer: b) Disease resistance

585. What is the primary goal of genetically engineered crops designed to improve yield and resource utilization?

a) Enhanced nutritional content

b) Increased shelf life

c) Increased yield

d) Insect resistance

Answer: c) Increased yield

586. Genetic engineering that enhances crops' nutritional content aims primarily to address:

a) Overproduction

b) Soil depletion

c) Nutritional deficiencies

d) Insect damage

Answer: c) Nutritional deficiencies

587. Which application of plant genetic engineering involves improving crops' ability to endure adverse climatic conditions?

a) Increased yield

b) Abiotic stress tolerance

c) Environmental sustainability

d) Disease resistance

Answer: b) Abiotic stress tolerance

588. Genetic modification to enhance crops' ability to resist specific herbicides is known as:

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Abiotic stress tolerance

Answer: a) Herbicide resistance

589. The process of enriching crops with essential nutrients to tackle nutritional deficiencies in the diet is referred to as:

a) Herbicide resistance

b) Disease resistance

c) Biofortification

d) Insect resistance

Answer: c) Biofortification

590. Genetic engineering that delays the ripening of fruits and vegetables, prolonging their storage life, is known as:

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Delayed ripening

Answer: d) Delayed ripening

591. The development of crops resistant to various pests and diseases primarily aims to enhance:

a) Yield

b) Shelf life

c) Pest control

d) Nutritional content

Answer: a) Yield

592. Genetic modification in crops to resist specific insects and pests is known as:

a) Herbicide resistance

b) Disease resistance

c) Insect resistance

d) Abiotic stress tolerance

Answer: c) Insect resistance

593. The process of enriching crops with essential nutrients through genetic modification primarily targets:

a) Pest control

b) Soil enrichment

c) Nutritional deficiencies

d) Increased yield

Answer: c) Nutritional deficiencies

594. Genetic engineering focused on enhancing crops' ability to tolerate environmental stresses such as drought and salinity primarily aims to improve:

a) Shelf life

b) Pest control

c) Yield stability

d) Nutritional content

Answer: c) Yield stability

595. Genetic engineering aiming to confer resistance in crops against specific herbicides involves:

a) Modifying weed growth

b) Enhancing plant growth

c) Modifying plant tolerance to specific herbicides

d) Increasing susceptibility to herbicide

Answer: c) Modifying plant tolerance to specific herbicides

596. Herbicide resistance through genetic modification primarily targets:

a) Enhancing weed growth

b) Preventing herbicide application

c) Enhancing herbicide effectiveness

d) Protecting crops from herbicide damage

Answer: d) Protecting crops from herbicide damage

597. In plant genetic engineering, what is the primary purpose of conferring herbicide resistance in crops?

a) Increasing crop yield

b) Reducing herbicide effectiveness

c) Allowing selective weed control

d) Limiting crop growth

Answer: c) Allowing selective weed control

598. Which genetic engineering approach allows crops to withstand the application of specific herbicides without being affected?

a) Reducing herbicide effectiveness

b) Enhancing weed growth

c) Modifying crop susceptibility to herbicides

d) Conferring herbicide tolerance in crops

Answer: d) Conferring herbicide tolerance in crops

599. Herbicide resistance achieved through genetic engineering results in crops being:

a) More susceptible to herbicides

b) Less responsive to herbicides

c) Tolerant to specific herbicides

d) Inhibited by herbicides

Answer: c) Tolerant to specific herbicides

600. The primary objective of genetically engineered herbicide-resistant crops is to:

a) Improve pesticide effectiveness

b) Reduce weed growth

c) Enable selective herbicide application

d) Limit crop yield

Answer: c) Enable selective herbicide application

601. What is the primary advantage of herbicide-resistant crops developed through genetic engineering?

a) Reduced agricultural productivity

b) Improved weed growth

c) Reduced dependence on herbicides

d) Decreased crop tolerance

Answer: c) Reduced dependence on herbicides

602. The primary focus of genetic engineering for herbicide resistance in crops is to:

a) Enhance weed growth

b) Promote soil health

c) Reduce herbicide effectiveness

d) Protect crops from herbicide damage

Answer: d) Protect crops from herbicide damage

603. What is the central aim of developing herbicide-resistant crops through genetic engineering?

a) Eliminate herbicide application

b) Increase crop vulnerability

c) Allow selective herbicide application

d) Decrease crop yield

Answer: c) Allow selective herbicide application

604. Herbicide-resistant crops created through genetic engineering enable:

a) More targeted and controlled weed management

b) Increased weed infestation

c) Wider use of herbicides

d) Decreased crop protection

Answer: a) More targeted and controlled weed management

605. The primary benefit of developing herbicide-resistant crops through genetic engineering is:

a) Improved soil fertility

b) Reduced crop protection

c) Selective and efficient weed control

d) Increased weed growth

Answer: c) Selective and efficient weed control

606. What is the primary goal of introducing herbicide resistance in crops through genetic engineering?

a) Limiting herbicide application

b) Promoting weed growth

c) Reducing crop yield

d) Allowing targeted weed control

Answer: d) Allowing targeted weed control

607. Herbicide-resistant crops produced through genetic engineering allow farmers to:

a) Eliminate weed problems completely

b) Increase herbicide usage

c) Reduce herbicide application

d) Experience decreased crop tolerance

Answer: c) Reduce herbicide application

608. The main advantage of genetically engineered herbicide-resistant crops is:

a) Increased vulnerability to herbicides

b) Limitation of herbicide effectiveness

c) Reduced weed control options

d) Enhanced herbicide selectivity

Answer: d) Enhanced herbicide selectivity

609. Herbicide resistance achieved through genetic modification allows crops to:

a) Better resist pest attacks

b) Survive without herbicides

c) Tolerate specific herbicides

d) Enhance weed growth

Answer: c) Tolerate specific herbicides

610. The primary application of herbicide resistance in genetically engineered crops is to:

a) Eliminate herbicide usage

b) Increase susceptibility to herbicides

c) Reduce weed competition

d) Limit crop growth

Answer: c) Reduce weed competition

611. Genetic engineering for herbicide resistance primarily aims to:

a) Decrease herbicide efficiency

b) Enhance crop sensitivity to herbicides

c) Protect crops from herbicides

d) Facilitate excessive herbicide use

Answer: c) Protect crops from herbicides

612. The main advantage of genetically engineered herbicide-resistant crops is:

a) Increased herbicide dependency

b) Selective weed control

c) Limitation in herbicide applications

d) Decreased crop protection

Answer: b) Selective weed control

613. The primary purpose of introducing herbicide resistance in crops through genetic engineering is to:

a) Enable excessive herbicide use

b) Limit weed management options

c) Allow selective and controlled herbicide application

d) Decrease crop productivity

Answer: c) Allow selective and controlled herbicide application

614. The main benefit of genetically engineered herbicide-resistant crops is:

a) Enhanced vulnerability to herbicides

b) Controlled and effective weed management

c) Limited herbicide selectivity

d) Increased susceptibility to weed growth

Answer: b) Controlled and effective weed management

615. Genetic engineering for insect tolerance primarily aims to:

a) Eliminate all insects from the crops

b) Enhance crop growth in the presence of insects

c) Make crops resistant to specific insect pests

d) Reduce crop yield

Answer: c) Make crops resistant to specific insect pests

616 . The primary objective of genetically engineered insect-tolerant crops is to:

a) Boost insect populations in crops

b) Provide shelter to insects

c) Reduce reliance on pesticides

d) Decrease crop productivity

Answer: c) Reduce reliance on pesticides

617. In plant genetic engineering, insect tolerance primarily involves:

a) Increasing susceptibility to insects

b) Reducing plant growth

c) Modifying crops to resist insect pests

d) Enhancing insect population

Answer: c) Modifying crops to resist insect pests

618.What is the primary purpose of conferring insect tolerance in crops through genetic engineering?

a) Limiting insect populations in crops

b) Protecting crops from insect damage

c) Increasing insect populations

d) Decreasing crop yield

Answer: b) Protecting crops from insect damage

619. In genetically engineered insect-tolerant crops, the main goal is to:

a) Increase crop susceptibility to insects

b) Repel all insects from the fields

c) Enable crops to tolerate specific insect pests

d) Decrease crop quality

Answer: c) Enable crops to tolerate specific insect pests

620. The primary advantage of genetically engineered insect-tolerant crops is:

a) Increased reliance on chemical insecticides

b) Enhanced susceptibility to insect pests

c) Reduction in insect damage

d) Decrease in crop resistance

Answer: c) Reduction in insect damage

621.What is the primary benefit of developing insect-tolerant crops through genetic engineering?

a) Increased insect populations

b) Reduced crop quality

c) Reduced dependence on insecticides

d) Limitation in insect control options

Answer: c) Reduced dependence on insecticides

622. The main objective of genetic engineering for insect tolerance in crops is to:

a) Enhance insect populations

b) Protect crops from insect pests

c) Decrease crop yield

d) Increase pesticide usage

Answer: b) Protect crops from insect pests

623. Insect-tolerant crops produced through genetic engineering allow farmers to:

a) Increase insect infestation

b) Decrease crop quality

c) Reduce insecticide application

d) Increase crop vulnerability

Answer: c) Reduce insecticide application

624. The primary goal of developing insect-tolerant crops through genetic engineering is to:

a) Limit insect control options

b) Protect crops from insect damage

c) Increase insecticide usage

d) Promote insect growth

Answer: b) Protect crops from insect damage

625. What is the main advantage of genetically engineered insect-tolerant crops?

a) Increased reliance on chemical insecticides

b) Enhanced susceptibility to insects

c) Reduction in insect-related losses

d) Decreased crop quality

Answer: c) Reduction in insect-related losses

626. The primary focus of genetic engineering for insect tolerance in crops is to:

a) Increase crop vulnerability to insects

b) Decrease insect populations

c) Protect crops from insect damage

d) Limit crop growth

Answer: c) Protect crops from insect damage

627. The main benefit of genetically engineered insect-tolerant crops is:

a) Increased crop vulnerability to insects

b) Reduction in insect-related losses

c) Enhanced susceptibility to insect pests

d) Decreased insect populations

Answer: b) Reduction in insect-related losses

628. Genetic engineering for insect tolerance primarily aims to:

a) Decrease crop susceptibility to insects

b) Limit insect control options

c) Protect crops from insect damage

d) Increase insect population

Answer: c) Protect crops from insect damage

629. Insect tolerance achieved through genetic modification allows crops to:

a) Resist all insect species

b) Better withstand specific insect pests

c) Promote insect growth

d) Enhance insect infestation

Answer: b) Better withstand specific insect pests

630. The primary application of insect tolerance in genetically engineered crops is to:

a) Enhance insect infestation

b) Increase insecticide usage

c) Reduce insect damage

d) Limit crop productivity

Answer: c) Reduce insect damage

631. Genetic engineering for insect tolerance primarily aims to:

a) Decrease crop susceptibility to insects

b) Limit insect control options

c) Protect crops from insect damage

d) Increase insect population

Answer: c) Protect crops from insect damage

632. The primary advantage of genetically engineered insect-tolerant crops is:

a) Increased reliance on chemical insecticides

b) Enhanced susceptibility to insects

c) Reduction in insect-related losses

d) Decreased crop quality

Answer: c) Reduction in insect-related losses

633. The main purpose of introducing insect tolerance in crops through genetic engineering is to:

a) Limit insect control options

b) Protect crops from insect damage

c) Increase insecticide usage

d) Promote insect growth

Answer: b) Protect crops from insect damage

634. The main benefit of genetically engineered insect-tolerant crops is:

a) Increased reliance on chemical insecticides

b) Enhanced susceptibility to insects

c) Reduction in insect-related losses

d) Decreased crop quality

Answer: c) Reduction in insect-related losses

Applications of Plant Genetic Engineering in Viral Tolerance

635. The primary goal of genetic engineering for viral tolerance in plants is to:

a) Eliminate all viruses from crops

b) Enhance plant growth in the presence of viruses

c) Make crops resistant to specific viruses

d) Reduce crop yield

Answer: c) Make crops resistant to specific viruses

636. Genetic modification aiming to confer viral resistance in crops primarily involves:

a) Increasing susceptibility to viruses

b) Reducing plant growth

c) Modifying crops to resist viral infections

d) Enhancing virus transmission

Answer: c) Modifying crops to resist viral infections

637. The main purpose of conferring viral tolerance in crops through genetic engineering is to:

a) Limit viral infections

b) Protect crops from viral diseases

c) Increase susceptibility to viruses

d) Decrease crop productivity

Answer: b) Protect crops from viral diseases

638. Viral tolerance achieved through genetic modification primarily allows crops to:

a) Resist all types of viruses

b) Better withstand specific viral infections

c) Promote virus spread

d) Enhance viral replication

Answer: b) Better withstand specific viral infections

639. In genetically engineered viral-tolerant crops, the main objective is to:

a) Increase crop susceptibility to viruses

b) Repel all viruses from the fields

c) Enable crops to tolerate specific viral diseases

d) Decrease crop quality

Answer: c) Enable crops to tolerate specific viral diseases

640. The primary advantage of genetically engineered viral-tolerant crops is:

a) Increased vulnerability to viruses

b) Limitation in virus control options

c) Reduction in viral diseases

d) Decrease in crop resistance

Answer: c) Reduction in viral diseases

641.What is the primary benefit of developing viral-tolerant crops through genetic engineering?

a) Increased virus spread

b) Reduced crop quality

c) Decreased dependence on pesticides

d) Limitation in viral control options

Answer: c) Decreased dependence on pesticides

642. The main focus of genetic engineering for viral tolerance in crops is to:

a) Increase crop vulnerability to viruses

b) Decrease virus populations

c) Protect crops from viral diseases

d) Limit crop growth

Answer: c) Protect crops from viral diseases

643. In genetically engineered viral-tolerant crops, the primary aim is to:

a) Increase virus infestation

b) Decrease crop quality

c) Reduce dependence on antiviral chemicals

d) Increase crop vulnerability

Answer: c) Reduce dependence on antiviral chemicals

644. The primary objective of developing viral-tolerant crops through genetic engineering is to:

a) Limit virus spread

b) Protect crops from viral damage

c) Increase dependence on antiviral chemicals

d) Decrease crop productivity

Answer: b) Protect crops from viral damage

645.What is the main advantage of genetically engineered viral-tolerant crops?

a) Increased virus transmission

b) Enhanced susceptibility to viral infections

c) Reduction in viral diseases

d) Decreased crop quality

Answer: c) Reduction in viral diseases

646. The primary application of viral tolerance in genetically engineered crops is to:

a) Enhance virus infestation

b) Limit virus control options

c) Reduce viral diseases

d) Decrease crop productivity

Answer: c) Reduce viral diseases

647. The main benefit of genetically engineered viral-tolerant crops is:

a) Increased vulnerability to viruses

b) Reduction in viral-related losses

c) Enhanced susceptibility to viral infections

d) Decreased virus populations

Answer: b) Reduction in viral-related losses

648. Genetic engineering for viral tolerance primarily aims to:

a) Decrease crop susceptibility to viruses

b) Limit virus control options

c) Protect crops from viral diseases

d) Increase virus populations

Answer: c) Protect crops from viral diseases

649. In genetically engineered viral-tolerant crops, viral tolerance primarily involves:

a) Reducing plant susceptibility to viruses

b) Promoting virus replication

c) Increasing virus transmission

d) Enhancing plant susceptibility to viruses

Answer: a) Reducing plant susceptibility to viruses

650. The primary application of viral tolerance in genetically engineered crops is to:

a) Increase susceptibility to viruses

b) Limit virus spread

c) Reduce viral diseases

d) Decrease crop yield

Answer: c) Reduce viral diseases

651. Genetic engineering for viral tolerance primarily aims to:

a) Decrease crop susceptibility to viruses

b) Limit virus control options

c) Protect crops from viral diseases

d) Increase virus populations

Answer: c) Protect crops from viral diseases

652. The main advantage of genetically engineered viral-tolerant crops is:

a) Increased vulnerability to viruses

b) Reduction in viral-related losses

c) Enhanced susceptibility to viral infections

d) Decreased crop quality

Answer: b) Reduction in viral-related losses

653. The primary purpose of introducing viral tolerance in crops through genetic engineering is to:

a) Limit virus control options

b) Protect crops from viral diseases

c) Increase dependence on antiviral chemicals

d) Promote virus spread

Answer: b) Protect crops from viral diseases

654. The main benefit of genetically engineered viral-tolerant crops is:

a) Increased vulnerability to viruses

b) Enhanced susceptibility to viral infections

c) Reduction in viral-related losses

d) Decreased crop quality

Answer: c) Reduction in viral-related losses

656. What is the primary function of using plants as bioreactors in biotechnology?

a) To produce biofuels

b) To generate pharmaceuticals and valuable proteins

c) To enhance plant growth

d) To improve plant aesthetics

Answer: b) To generate pharmaceuticals and valuable proteins

657. Which part of the plant is most commonly used as a bioreactor for protein production?

a) Leaves

b) Roots

c) Flowers

d) Stems

Answer: a) Leaves

658. Which technology is used to introduce foreign genes into plants for the production of desired proteins in plant bioreactors?

a) PCR (Polymerase Chain Reaction)

b) CRISPR-Cas9

c) Genetic transformation

d) Southern blotting

Answer: c) Genetic transformation

659. What advantage do plants offer as bioreactors over microbial or mammalian systems?

a) Lower production capacity

b) Greater cost-effectiveness

c) Inability to express recombinant proteins

d) Reduced scalability

Answer: b) Greater cost-effectiveness

660. Which plant has been extensively used as a bioreactor due to its ability to produce large amounts of recombinant proteins?

a) Arabidopsis thaliana

b) Tobacco (Nicotiana benthamiana)

c) Rose (Rosa spp.)

d) Dandelion (Taraxacum officinale)

Answer: b) Tobacco (Nicotiana benthamiana)

661. What is the term used to describe the process where plants are genetically modified to produce pharmaceuticals or industrial compounds?

a) Plant transformation

b) Plant expression system

c) Plant-based recombinant protein production

d) Transgenic cultivation

Answer: c) Plant-based recombinant protein production

662. Which aspect makes plants as bioreactors a favorable option for producing pharmaceuticals?

a) Slow growth rate

b) Complexity of gene insertion

c) Ability to perform post-translational modifications

d) Inability to express foreign genes

Answer: c) Ability to perform post-translational modifications

663. Which of the following is a challenge associated with using plants as bioreactors?

a) Inability to express recombinant proteins

b) Lack of scalability

c) Risk of environmental contamination

d) Reduced flexibility in gene manipulation

Answer: c) Risk of environmental contamination

664.Which factor contributes to the scalability of plant bioreactors for large-scale protein production?

a) High production costs

b) Limited availability of plant species

c) Plant growth conditions

d) Inability to perform gene expression

Answer: c) Plant growth conditions

665. What is a critical consideration when using plants as bioreactors for producing pharmaceuticals?

a) High mutation rates

b) Post-translational modifications

c) Slow growth rate

d) Inability to express recombinant proteins

Answer: b) Post-translational modifications

666. What is the primary purpose of genetically modifying crops in agriculture?

a) To reduce crop yield

b) To increase dependence on pesticides

c) To enhance resistance to pests and diseases

d) To limit crop variety

Answer: c) To enhance resistance to pests and diseases

. 667.Which of the following is an example of a transgenic plant?

a) Non-GMO tomato plant

b) Corn plant with genes from a bacterium for insect resistance

c) Conventional soybean plant

d) Wheat plant with no genetic modifications

Answer: b) Corn plant with genes from a bacterium for insect resistance

668. What is the primary advantage of genetically modified (GM) crops in agriculture?

a) Increased susceptibility to diseases

b) Decreased crop yield

c) Reduced environmental impact from pesticides

d) Enhanced crop diversity

Answer: c) Reduced environmental impact from pesticides

669.What technique is primarily used to introduce foreign genes into crops for genetic modification?

a) Microbial fermentation

b) Traditional cross-breeding

c) Genetic transformation

d) Polymerase chain reaction (PCR)

Answer: c) Genetic transformation

670. Which statement best describes genetically modified (GM) foods?

a) Foods that contain genes from animals

b) Foods that have undergone physical alterations

c) Foods produced through traditional breeding methods

d) Foods derived from crops with altered genetic material

Answer: d) Foods derived from crops with altered genetic material

671. Which of the following is an example of a genetically modified crop used in agriculture?

a) Organic apples

b) Non-GMO wheat

c) GM soybeans with herbicide resistance

d) Conventional rice

Answer: c) GM soybeans with herbicide resistance

672. What is the primary reason for introducing genetic modifications in crops such as corn or soybeans?

a) To decrease yield potential

b) To increase dependence on pesticides

c) To enhance herbicide or pest resistance

d) To limit food production

Answer: c) To enhance herbicide or pest resistance

673. Which regulatory body oversees the safety assessment and approval of genetically modified foods in the United States?

a) FDA (Food and Drug Administration)

b) EPA (Environmental Protection Agency)

c) USDA (United States Department of Agriculture)

d) WHO (World Health Organization)

Answer: a) FDA (Food and Drug Administration)

674. What is the primary objective of developing genetically modified crops with herbicide resistance?

a) To decrease crop yield

b) To increase reliance on chemical herbicides

c) To reduce the need for excessive herbicide use

d) To limit crop diversity

Answer: c) To reduce the need for excessive herbicide use

675. Which of the following statements regarding genetically modified organisms (GMOs) in agriculture is true?

a) GMOs always pose environmental risks

b) GMOs have no impact on reducing pesticide use

c) GMOs are extensively regulated for safety before commercialization

d) GMOs never contribute to increased crop yield

Answer: c) GMOs are extensively regulated for safety before commercialization

676. What is a primary concern regarding the ecological impact of transgenic plants?

a) Increased biodiversity

b) Potential effects on non-target organisms

c) Enhanced soil fertility

d) Decreased agricultural productivity

Answer: b) Potential effects on non-target organisms

677. Which of the following is a potential ecological risk associated with transgenic plants?

a) Increased resistance to pests

b) Reduced use of chemical pesticides

c) Harm to beneficial insects like pollinators

d) Enhanced soil structure

Answer: c) Harm to beneficial insects like pollinators

678. What is a crucial consideration when assessing the ecological impact of transgenic plants?

a) Reduction in invasive species

b) Preservation of natural habitats

c) Greater food availability

d) Enhanced water usage

Answer: b) Preservation of natural habitats

679. Which aspect should be evaluated to understand the ecological implications of a transgenic plant?

a) Soil pH levels

b) Genetic stability of the transgene

c) Crop market value

d) Average rainfall patterns

Answer: b) Genetic stability of the transgene

680. What can be a potential adverse effect on non-target organisms due to transgenic plants?

a) Increased predation

b) Reduced environmental impact

c) Harm to soil microbes

d) Enhanced biodiversity

Answer: c) Harm to soil microbes

681. What might be a potential ecological advantage of some transgenic plants?

a) Decreased water usage

b) Increased pesticide resistance

c) Enhanced competition with weeds

d) Reduced soil erosion

Answer: a) Decreased water usage

682. Which of the following is a key aspect evaluated to determine the ecological safety of transgenic plants?

a) Genetic diversity of local fauna

b) Impact on soil microorganisms

c) Market price fluctuations

d) Crop yield variations

Answer: b) Impact on soil microorganisms

683. What is a possible concern regarding the impact of transgenic plants on ecosystems?

a) Enhanced conservation efforts

b) Decreased dependence on fertilizers

c) Potential disruption of food webs

d) Greater adaptability of local flora

Answer: c) Potential disruption of food webs

684. What is an essential aspect to consider when evaluating the ecological impact of transgenic plants on a broader scale?

a) Regional weather patterns

b) Long-term effects on biodiversity and ecosystem function

c) Average farm sizes

d) Market demands for specific crops

Answer: b) Long-term effects on biodiversity and ecosystem function

685. What is a possible consequence of transgenic plants interbreeding with wild relatives in natural habitats?

a) Increased genetic diversity

b) Enhanced species adaptation

c) Potential ecological disruption

d) Improved soil fertility

Answer: c) Potential ecological disruption

686. Secondary metabolites in plants are primarily involved in:

a) Essential growth and development processes

b) Basic cellular respiration

c) Defense mechanisms and adaptation to the environment

d) Photosynthetic reactions

Answer: c) Defense mechanisms and adaptation to the environment

687. Which of the following is NOT a primary function of secondary metabolites in plants?

a) Defense against herbivores

b) Attracting pollinators

c) Regulating photosynthesis

d) Protection from pathogens

Answer: c) Regulating photosynthesis

688. Secondary metabolites are synthesized primarily in which part of the plant?

a) Roots

b) Leaves

c) Flowers

d) Stems

Answer: b) Leaves

689. Which enzyme group is typically involved in the biosynthesis of secondary metabolites in plants?

a) Polymerases

b) Lipases

c) Oxidoreductases

d) Terpene synthases

Answer: d) Terpene synthases

690. What is the main purpose of terpenoids in plants' secondary metabolism?

a) Regulation of plant growth

b) Protection against pathogens and herbivores

c) Enhancing photosynthesis

d) Facilitating water uptake

Answer: b) Protection against pathogens and herbivores

691. Alkaloids, a class of secondary metabolites, are known for their:

a) Role in cell structure formation

b) Involvement in pigmentation

c) Medicinal properties and defense mechanisms

d) Participation in photosynthetic reactions

Answer: c) Medicinal properties and defense mechanisms

692. Which secondary metabolite functions primarily as a defense mechanism against herbivores and pathogens in plants?

a) Flavonoids

b) Anthocyanins

c) Phenolic compounds

d) Lignin

Answer: c) Phenolic compounds

693. The role of flavonoids in plants primarily involves:

a) Water transport

b) UV protection and pigmentation

c) Regulation of osmotic pressure

d) Mineral absorption

Answer: b) UV protection and pigmentation

694. Which of the following is NOT a group of secondary metabolites in plants?

a) Tannins

b) Carbohydrates

c) Saponins

d) Glycosides

Answer: b) Carbohydrates

695. Which environmental factor often induces the production of secondary metabolites in plants?

a) Adequate water availability

b) Abundance of nutrients

c) Presence of herbivores or pathogens

d) High levels of carbon dioxide

Answer: c) Presence of herbivores or pathogens

696. Alkaloids are a class of compounds primarily known for their:

a) Role in enhancing plant growth

b) Medicinal properties and potential toxicity

c) Pigmentation and color enhancement

d) Contribution to photosynthesis

Answer: b) Medicinal properties and potential toxicity

697. Which of the following plants is known for producing alkaloids used in the pharmaceutical industry?

a) Sunflowers (Helianthus annuus)

b) Potatoes (Solanum tuberosum)

c) Poppy (Papaver somniferum)

d) Aloe vera

Answer: c) Poppy (Papaver somniferum)

698. Which alkaloid is derived from the opium poppy and is used as a powerful analgesic in medicine?

a) Nicotine

b) Morphine

c) Caffeine

d) Quinine

Answer: b) Morphine

699. Which of the following alkaloids is primarily found in the leaves of the coca plant and has stimulant properties?

a) Cocaine

b) Atropine

c) Codeine

d) Quinidine

Answer: a) Cocaine

700. Alkaloids are often used in the pharmaceutical industry due to their:

a) Absence of any medicinal properties

b) Toxicity and adverse effects on health

c) Diverse pharmacological activities and therapeutic benefits

d) Lack of importance in traditional medicine

Answer: c) Diverse pharmacological activities and therapeutic benefits

701. Which class of phytochemicals derived from plants can be utilized in the production of biodegradable plastics?

a) Flavonoids
b) Alkaloids
c) Terpenes
d) All of the above

Answer: d) All of the above

702. What role do phytochemicals play in the creation of biodegradable plastics?

a) They accelerate the decomposition process
b) They act as colorants for the plastics
c) They provide structural integrity to the plastics
d) They inhibit biodegradation

Answer: c) They provide structural integrity to the plastics

703. Which of these plant-derived compounds is commonly used as a plasticizer in biodegradable plastics?

a) Resveratrol
b) Lignin
c) Carotenoids
d) Citric acid

Answer: d) Citric acid

704. The process of extracting phytochemicals for biodegradable plastics is often carried out from which part of the plant?

a) Leaves
b) Stems
c) Roots
d) Various plant parts depending on the compound

Answer: d) Various plant parts depending on the compound

705. How do phytochemicals contribute to the environmental benefit of biodegradable plastics?

a) By enhancing the durability of the plastics
b) By speeding up their decomposition
c) By increasing their toxicity to microorganisms
d) By making them non-biodegradable

Answer: b) By speeding up their decomposition

706. Which of the following is a key advantage of using phytochemicals in biodegradable plastics?

a) They decrease the flexibility of the plastics
b) They increase the cost of production
c) They reduce the reliance on fossil fuels
d) They hinder the biodegradation process

Answer: c) They reduce the reliance on fossil fuels

707. Which plant-based polymer is commonly used in the creation of biodegradable plastics?

a) Cellulose
b) Silicon
c) Polyester
d) Nylon

Answer: a) Cellulose

708. The utilization of phytochemicals in biodegradable plastics contributes to:

a) Increased plastic waste in landfills
b) Reduced dependence on synthetic polymers
c) Higher greenhouse gas emissions
d) Longer decomposition periods

Answer: b) Reduced dependence on synthetic polymers

709. Which plant extract is known for its antimicrobial properties and is sometimes used in biodegradable plastics to prevent microbial degradation?

a) Tea tree oil
b) Lavender oil
c) Eucalyptus oil

d) Peppermint oil

Answer: a) Tea tree oil

710. The incorporation of phytochemicals in biodegradable plastics may lead to:

a) Decreased flexibility and strength of the plastics
b) Reduced cost-effectiveness
c) Increased environmental sustainability
d) Slower degradation rate

Answer: c) Increased environmental sustainability

711. Which of the following is an example of a therapeutic protein derived from plants?

a) Insulin
b) Aspirin
c) Ibuprofen
d) Paracetamol

Answer: a) Insulin

712. What role do therapeutic proteins play in the medical field?

a) They are used as painkillers
b) They help in reducing fever
c) They treat diseases like diabetes, cancer, and autoimmune disorders
d) They aid in digestion

Answer: c) They treat diseases like diabetes, cancer, and autoimmune disorders

713. Antibodies produced from plants are known as:

a) Immunoglobulins
b) Enzymes
c) Antioxidants
d) Cytokines

Answer: a) Immunoglobulins

714. How are plant-derived antibodies used in medicine?

a) To induce fever in patients
b) To enhance allergic reactions

c) To fight infections and treat diseases

d) To increase blood clotting

Answer: c) To fight infections and treat diseases

715. Plant-based vaccines utilize which part of the plant for production?

a) Fruits

b) Leaves

c) Roots

d) Stems

Answer: b) Leaves

716. What advantage do plant-based vaccines offer over traditional vaccines?

a) They have shorter shelf lives

b) They require higher doses for effectiveness

c) They can be produced more affordably and quickly

d) They have higher chances of causing allergies

Answer: c) They can be produced more affordably and quickly

717. Which of the following is a primary characteristic of herbal drugs derived from plants?

a) They are synthesized artificially in laboratories

b) They do not have medicinal properties

c) They are used solely for cosmetic purposes

d) They contain active compounds for medicinal use

Answer: d) They contain active compounds for medicinal use

718. What distinguishes herbal drugs from conventional pharmaceutical drugs?

a) Herbal drugs have no side effects

b) Herbal drugs are always safe for consumption

c) Herbal drugs are derived from natural sources like plants

d) Herbal drugs are more potent than conventional drugs

Answer: c) Herbal drugs are derived from natural sources like plants

719. Bioethanol is a type of renewable fuel produced through the fermentation of:

a) Sugar cane or corn

b) Coal
c) Petroleum
d) Natural gas

Answer: a) Sugar cane or corn

720. What is the primary benefit of using bioethanol as a fuel source?

a) It increases greenhouse gas emissions
b) It reduces reliance on fossil fuels
c) It is more expensive than gasoline
d) It has a higher carbon footprint

Answer: b) It reduces reliance on fossil fuels

721. Biodiesel is commonly produced from:

a) Algae and waste cooking oil
b) Coal and natural gas
c) Petroleum reserves
d) Sugar cane and corn

Answer: a) Algae and waste cooking oil

722. What is a significant advantage of biodiesel compared to conventional diesel?

a) Biodiesel emits higher levels of pollutants
b) Biodiesel is more expensive to produce
c) Biodiesel is a renewable and cleaner-burning fuel
d) Biodiesel has a lower energy content

Answer: c) Biodiesel is a renewable and cleaner-burning fuel

723. Which of the following methods is commonly used for the extraction of phytochemicals from plant material?

a) Mechanical pressing
b) Heat treatment
c) Cold extraction with solvents
d) Exposure to direct sunlight

Answer: c) Cold extraction with solvents

724. Which technique is primarily used for the purification of extracted phytochemicals?

a) Distillation
b) Chromatography
c) Filtration
d) Evaporation

Answer: b) Chromatography

725. What is the primary goal of phytoremediation?

a) To increase soil fertility
b) To eliminate all plant species from polluted areas
c) To use plants to remove, detoxify, or immobilize environmental pollutants
d) To enhance the growth of invasive plant species

Answer: c) To use plants to remove, detoxify, or immobilize environmental pollutants

726. Which of the following pollutants can be addressed through phytoremediation?

a) Heavy metals
b) Pesticides and herbicides
c) Radioactive elements
d) All of the above

Answer: d) All of the above

727. Which part of the plant is primarily involved in phytoremediation?

a) Roots
b) Leaves
c) Flowers
d) Stems

Answer:a) Roots

728. Which mechanism in plants helps in the removal of contaminants during phytoremediation?

a) Evaporation through leaves
b) Adsorption by root exudates
c) Photosynthesis in leaves
d) Transportation through stems

Answer: b) Adsorption by root exudates

729. What is the term used to describe the process in which plants absorb pollutants and accumulate them in their tissues during phytoremediation?

a) Bioaccumulation
b) Biodegradation
c) Biomagnification
d) Biotransformation

Answer: a) Bioaccumulation

730. Which plant species is often used in phytoremediation due to its ability to accumulate heavy metals?

a) Sunflower (Helianthus annuus)
b) Rose (Rosa)
c) Lily (Lilium)
d) Tulip (Tulipa)

Answer: a) Sunflower (Helianthus annuus)

731. Phytoremediation is considered an environmentally friendly approach because:

a) It accelerates the release of pollutants into the atmosphere
b) It minimizes the need for soil excavation and disposal
c) It worsens soil quality by adding more pollutants
d) It requires the use of chemical agents harmful to plants

Answer: b) It minimizes the need for soil excavation and disposal

732. What role do microorganisms play in phytoremediation?

a) They compete with plants for nutrients
b) They inhibit plant growth
c) They assist in breaking down contaminants and enhancing plant uptake
d) They have no influence on the process

Answer: c) They assist in breaking down contaminants and enhancing plant uptake

733. The model plant species utilized for the Plant Genome Project is:

a) Tomato (Solanum lycopersicum)

b) Arabidopsis thaliana
c) Rice (Oryza sativa)
d) Maize (Zea mays)

Answer: b) Arabidopsis thaliana

744. What is the primary objective of the Plant Genome Project?

a) To genetically modify all plant species
b) To map the entire genome of various plant species
c) To understand the genetic makeup of a single plant species
d) To create new plant species

Answer: b) To map the entire genome of various plant species

Arabidopsis

745. Arabidopsis thaliana is widely used in plant research due to its:

a) Large size and fast growth rate
b) Ease of genetic manipulation and short life cycle
c) Resistance to all types of environmental conditions
d) Lack of genetic diversity

Answer: b) Ease of genetic manipulation and short life cycle

746. What part of Arabidopsis is primarily studied for genetic research?

a) Roots
b) Flowers
c) Leaves
d) Seeds

Answer: c) Leaves

Cryopreservation

747. Cryopreservation is the process of preserving biological material at:

a) Extremely high temperatures
b) Room temperature

c) Extremely low temperatures

d) Varying temperatures

Answer: c) Extremely low temperatures

748. Which method is commonly used in cryopreservation to store plant genetic material?

a) Drying in the sun

b) Freezing in liquid nitrogen

c) Exposing to ultraviolet radiation

d) Encapsulation in plastic bags

Answer: b) Freezing in liquid nitrogen

Germplasm Conservation

749. Germplasm conservation aims to preserve:

a) Only seeds of economically important plants

b) Genetic material of plant species for future use

c) Entire plants in botanical gardens

d) Only rare and endangered plant species

Answer: b) Genetic material of plant species for future use

750. What is the purpose of maintaining germplasm collections?

a) To prevent the growth of plant species

b) To create genetically modified organisms

c) To preserve genetic diversity and prevent extinction

d) To eliminate natural variability in plants

Answer: c) To preserve genetic diversity and prevent extinction

751. Which organization is involved in the global coordination of germplasm conservation efforts?

a) United Nations Educational, Scientific, and Cultural Organization (UNESCO)

b) World Health Organization (WHO)

c) Food and Agriculture Organization (FAO) of the United Nations

d) International Monetary Fund (IMF)

e) **Answer: c) Food and Agriculture Organization (FAO) of the United Nations**

752. Germplasm conservation contributes to:

a) Decreasing biodiversity
b) Losing genetic variability in crops
c) Safeguarding plant species for future generations
d) Introducing invasive plant species

Answer: c) Safeguarding plant species for future generations

753. What is the primary goal of metabolic engineering in plants?

a) To increase plant size
b) To modify plant color
c) To enhance the production of specific compounds or metabolites
d) To decrease plant growth rate

Answer: c) To enhance the production of specific compounds or metabolites

754. Which technique is commonly employed in metabolic engineering to modify plant metabolism?

a) Genetic modification
b) Soil enrichment
c) Water irrigation
d) Exposure to sunlight

Answer: a) Genetic modification

755. What is the role of enzymes in metabolic engineering of plants?

a) To inhibit metabolic pathways
b) To accelerate metabolic reactions
c) To store excess energy
d) To reduce plant growth

Answer: b) To accelerate metabolic reactions

756. Which of the following is an example of a product targeted for enhancement through metabolic engineering in plants?

a) Oxygen

b) Carbon dioxide
c) Starch or pharmaceutical compounds
d) Nitrogen

Answer: c) Starch or pharmaceutical compounds

757. What plant-based compound is commonly targeted for metabolic engineering to produce biofuels?

a) Lignin
b) Chlorophyll
c) Cellulose
d) Starch

Answer: c) Cellulose

758. Which approach is used to introduce foreign genes into plant genomes for metabolic engineering?

a) Phytomutation
b) DNA replication
c) Genetic transformation
d) Chlorophyll modification

Answer: c) Genetic transformation

759. What advantage does metabolic engineering offer in plant-based pharmaceutical production?

a) Decreased production costs
b) Faster plant growth
c) Decreased yield of pharmaceutical compounds
d) Reduced efficiency in plant metabolic processes

Answer: a) Decreased production costs

760. What potential benefit does metabolic engineering bring to crop plants?

a) Reduction in crop yield
b) Increased susceptibility to pests and diseases
c) Improvement in nutritional value or stress resistance
d) Slower growth rate

Answer: cs) Improvement in nutritional value or stress resistance

761. Which field does metabolic engineering in plants intersect with for improving agricultural productivity?

a) Astrophysics
b) Anthropology
c) Botany
d) Agronomy

Answer: d) Agronomy

762. What challenge is associated with metabolic engineering in plants?

a) Difficulty in identifying suitable genes for modification
b) Lack of available water for the plants
c) High adaptability of plants to genetic modifications
d) Overproduction of desired compounds

Answer: a) Difficulty in identifying suitable genes for modification

About The Authors

Dr. J. Caroline Rose is a highly accomplished professional in the field of Biochemistry and Environmental Biotechnology. Her extensive educational background includes multiple postgraduate degrees in Biochemistry, Environment & Ecology and research-based degrees like M.Phil and Ph.D. Starting her career as a Biochemist in Clinical Research Centre, she later transitioned to the teaching profession, driven by her passion for teaching and research.Currently serving as the Principal of St. Joseph's College of Arts and Science for Women in Hosur, she has amassed an impressive 27 years of versatile experience in academia. Dr. Rose is an author of over 25 papers published in National and International Journals..Her expertise extents across various domains including Biochemistry, Plant Biotechnology, Cell and Molecular Biology, and Environmental Biotechnology. Dr. Rose's commitment to academia is evident through her mentorship of numerous M.Phil and Ph.D. students, nurturing the next generation of researchers in her specialized fields.

Mrs. Margret Kanimozhi A. M.Sc.,M.Phil., B.Ed.,Ph.D
Margret Kanimozhi A has served as an Assistant Professor in the Department of Biotechnology,St.Joseph's College of Arts and science for Women, Hosur. She has accumulated 23 years of experience in the field of teaching showcasing her expertise in plant biotechnology. Her professional journey includes teaching, research, and mentorship.She has published numerous research papers in reputable journals, sharing her insights and discoveries with the scientific community. Her area of Interest include Cell Biology, Molecular Biology,Biochemistry and Genetic Engineering.

9 789334 016857