

QUESTION BANK OF BOTANY

By

Prof. Dr. Saadullah Khan

Here are 100 multiple-choice questions on Environmental Biology, covering additional topics like population ecology, environmental chemistry, conservation strategies, climate change, and environmental health. The answer key is provided at the end.

1. The specific role or function of an organism within its ecosystem is called its:
A) Habitat
B) Niche
C) Biotype
D) Ecotone
2. A group of individuals of the same species living in a specific area at the same time is a:
A) Community
B) Ecosystem
C) Population
D) Biosphere
3. Which of the following is an example of a density-dependent factor affecting population growth?
A) Flood
B) Drought
C) Disease
D) Forest fire
4. The maximum reproductive capacity of a population under optimal conditions is known as:
A) Carrying capacity
B) Biotic potential
C) Environmental resistance
D) Population density
5. A J-shaped growth curve is characteristic of:
A) Logistic growth
B) Exponential growth
C) Zero population growth
D) Negative growth
6. An S-shaped growth curve is characteristic of:
A) Exponential growth
B) Logistic growth
C) Linear growth
D) Declining growth
7. The study of the distribution and abundance of organisms is called:
A) Ethology
B) Synecology
C) Autecology

D) Biogeography

8. Which of the following best describes a food web?

A) A single linear sequence of who eats whom

B) A complex network of interconnected food chains

C) The total biomass of organisms in a trophic level

D) The energy flow from the sun to producers

9. Approximately what percentage of energy is transferred from one trophic level to the next?

A) 90%

B) 50%

C) 10%

D) 1%

10. The pyramid of energy in an ecosystem is always:

A) Inverted

B) Upright

C) Spindle-shaped

D) Irregular

11. Which biogeochemical cycle is primarily dependent on bacteria for its conversion into a usable form?

A) Carbon cycle

B) Phosphorus cycle

C) Nitrogen cycle

D) Water cycle

12. The process by which nitrates are converted back into atmospheric nitrogen gas is called:

A) Nitrogen fixation

B) Nitrification

C) Ammonification

D) Denitrification

13. The main reservoir of phosphorus in the phosphorus cycle is:

A) The atmosphere

B) Rocks and sediments

C) The oceans

D) Living organisms

14. Which of the following is a major sink for carbon dioxide in the carbon cycle?

A) The atmosphere

B) Fossil fuels

C) Forests and oceans

D) Volcanic eruptions

15. The greenhouse effect is a natural phenomenon that is essential for life because it:

A) Prevents ozone depletion

B) Traps heat in the atmosphere, keeping the Earth warm

C) Provides energy for photosynthesis

D) Regulates the water cycle

16. The enhanced greenhouse effect is primarily caused by:

A) An increase in solar radiation

B) Volcanic eruptions

- C) Human activities that increase greenhouse gas concentrations
 - D) Changes in the Earth's orbit
17. Which of the following greenhouse gases has the highest global warming potential (GWP)?
- A) Carbon dioxide
 - B) Methane
 - C) Nitrous oxide
 - D) Sulphur hexafluoride
18. The main source of carbon monoxide (CO) in urban areas is:
- A) Industrial processes
 - B) Incomplete combustion of fuel in motor vehicles
 - C) Decomposition of organic waste
 - D) Agricultural activities
19. Which of the following pollutants is most responsible for the formation of photochemical smog?
- A) Sulphur dioxide
 - B) Soot and dust
 - C) Nitrogen oxides (NO_x) and Volatile Organic Compounds (VOCs)
 - D) Carbon monoxide
20. The pH of acid rain is typically:
- A) Greater than 7
 - B) Around 7
 - C) Less than 5.6
 - D) Exactly 5.6
21. Acid rain can cause damage to:
- A) Aquatic ecosystems, forests, and buildings
 - B) Only terrestrial ecosystems
 - C) Only aquatic ecosystems
 - D) Only human health
22. The ozone layer is found in which layer of the atmosphere?
- A) Troposphere
 - B) Stratosphere
 - C) Mesosphere
 - D) Thermosphere
23. The main function of the ozone layer is to:
- A) Regulate global temperature
 - B) Absorb infrared radiation
 - C) Absorb harmful ultraviolet (UV) radiation from the sun
 - D) Protect against meteors
24. Which of the following is a major source of chlorofluorocarbons (CFCs)?
- A) Aerosol propellants and refrigerants
 - B) Automobile exhaust
 - C) Burning of fossil fuels
 - D) Agricultural fertilizers
25. The thinning of the ozone layer is most pronounced over:
- A) The Equator

- B) The Tropics
 - C) Antarctica
 - D) The Arctic Ocean
26. Biochemical Oxygen Demand (BOD) is a measure of:
- A) The amount of dissolved oxygen in water
 - B) The amount of organic matter in water
 - C) The amount of oxygen consumed by microorganisms while decomposing organic matter
 - D) The number of bacteria in water
27. High BOD levels in a water body indicate:
- A) High levels of dissolved oxygen
 - B) High levels of organic pollution
 - C) Low levels of nutrients
 - D) Clean water
28. An algal bloom is a rapid increase in the population of algae, often caused by:
- A) Decreased sunlight
 - B) Eutrophication
 - C) Increased oxygen levels
 - D) Low nutrient levels
29. The contamination of groundwater by arsenic is a major health issue in which of the following countries?
- A) United States and Canada
 - B) Bangladesh and India
 - C) Australia and New Zealand
 - D) Brazil and Argentina
30. Biomagnification is particularly concerning for pollutants that are:
- A) Highly water-soluble
 - B) Lipophilic (fat-soluble) and non-biodegradable
 - C) Highly biodegradable
 - D) Gaseous at room temperature
31. DDT, a persistent pesticide, is a classic example of a substance that undergoes:
- A) Eutrophication
 - B) Bioremediation
 - C) Biomagnification
 - D) Biodegradation
32. The use of living organisms, such as bacteria or plants, to clean up pollutants is called:
- A) Biodegradation
 - B) Bioremediation
 - C) Bioaccumulation
 - D) Biomagnification
33. Which of the following is a method of in-situ conservation?
- A) Seed banks
 - B) Botanical gardens
 - C) Zoological parks
 - D) National parks and wildlife sanctuaries
34. The 'Project Tiger' in India is an example of:

- A) Ex-situ conservation
 - B) Species-specific conservation program
 - C) Habitat restoration
 - D) Sustainable development
35. Which of the following is a major threat to coral reefs?
- A) Increased ocean acidity and rising sea temperatures
 - B) Increased fishing
 - C) Decreased salinity
 - D) Increased oxygen levels
36. The main cause of the decline in amphibian populations globally is:
- A) Over-hunting
 - B) Habitat loss, pollution, and climate change
 - C) Invasive species
 - D) Lack of food
37. A species that is at a high risk of extinction in the wild is classified by the IUCN as:
- A) Vulnerable
 - B) Endangered
 - C) Critically Endangered
 - D) Extinct in the Wild
38. The Convention on International Trade in Endangered Species (CITES) aims to:
- A) Protect all species in their natural habitats
 - B) Regulate the international trade of wildlife species
 - C) Reduce greenhouse gas emissions
 - D) Promote sustainable development
39. 'Slash and burn' agriculture is a major driver of deforestation in:
- A) Temperate regions
 - B) Tropical regions
 - C) Arctic regions
 - D) Desert regions
40. Which of the following is a type of renewable energy that is derived from the Earth's internal heat?
- A) Solar energy
 - B) Wind energy
 - C) Geothermal energy
 - D) Hydroelectric energy
41. The main environmental concern associated with nuclear power is:
- A) The release of greenhouse gases
 - B) The disposal of radioactive waste
 - C) The depletion of the ozone layer
 - D) Acid rain
42. The concept of 'circular economy' aims to:
- A) Maximize resource extraction
 - B) Minimize waste and pollution by keeping resources in use for as long as possible
 - C) Focus solely on recycling
 - D) Increase the use of single-use plastics

43. An ecological pyramid that can be inverted is the pyramid of:
- A) Energy
 - B) Biomass
 - C) Number
 - D) Both Biomass and Number
44. In a food chain, a lion is considered a:
- A) Primary consumer
 - B) Secondary consumer
 - C) Tertiary consumer
 - D) Decomposer
45. The type of interaction where one species benefits and the other is harmed is called:
- A) Commensalism
 - B) Mutualism
 - C) Parasitism
 - D) Amensalism
46. The interaction between a clownfish and a sea anemone is an example of:
- A) Parasitism
 - B) Commensalism
 - C) Mutualism
 - D) Competition
47. The amount of energy captured by autotrophs in an ecosystem is called:
- A) Net primary productivity
 - B) Gross primary productivity
 - C) Secondary productivity
 - D) Total biomass
48. The maximum rate at which a renewable resource can be harvested without reducing its ability to regenerate is called:
- A) Maximum sustainable yield
 - B) Carrying capacity
 - C) Environmental resistance
 - D) Biotic potential
49. The 'Tragedy of the Commons' theory was popularized by:
- A) Rachel Carson
 - B) Garrett Hardin
 - C) Charles Darwin
 - D) E.O. Wilson
50. The Intergovernmental Panel on Climate Change (IPCC) is a scientific body that assesses the science related to:
- A) Ozone depletion
 - B) Biodiversity loss
 - C) Climate change
 - D) Desertification
51. The study of the interactions between organisms and their environment is called:
- A) Zoology

- B) Botany
- C) Ecology
- D) Genetics

52. The term "ecosystem" was first coined by:

- A) Charles Darwin
- B) Arthur Tansley
- C) Rachel Carson
- D) E.P. Odum

53. Which of the following is an abiotic component of an ecosystem?

- A) Bacteria
- B) Fungi
- C) Water
- D) Plants

54. The primary source of energy for all ecosystems is:

- A) Geothermal heat
- B) The Sun
- C) Chemical reactions
- D) Wind

55. Which trophic level forms the base of a food chain?

- A) Primary consumers
- B) Secondary consumers
- C) Producers
- D) Decomposers

56. The process by which plants convert light energy into chemical energy is called:

- A) Respiration
- B) Transpiration
- C) Photosynthesis
- D) Decomposition

57. A consumer that eats both plants and animals is called a(n):

- A) Herbivore
- B) Carnivore
- C) Omnivore
- D) Detritivore

58. Which of the following is a detritivore?

- A) Earthworm
- B) Lion
- C) Deer
- D) Grasshopper

59. The gradual and predictable change in the species composition of an area over time is known as:

- A) Evolution

B) Succession

C) Adaptation

D) Mutation

60. The final, stable community in a successional sequence is called the:

A) Pioneer community

B) Seral community

C) Climax community

D) Transitional community

61. The maximum population size that an environment can sustain indefinitely is called:

A) Population density

B) Growth rate

C) Carrying capacity

D) Biotic potential

62. The term "biosphere" refers to:

A) All the living organisms on Earth

B) The zone of life on Earth, encompassing land, water, and air

C) Only the aquatic parts of the Earth

D) The solid part of the Earth's crust

63. Which of the following is a major terrestrial biome characterized by low rainfall and extreme temperatures?

A) Tropical rainforest

B) Tundra

C) Grassland

D) Temperate deciduous forest

64. The biome with the highest biodiversity is the:

A) Desert

B) Boreal forest

C) Tropical rainforest

D) Temperate grassland

65. Which zone in a lake has the highest concentration of photosynthetic organisms?

A) Littoral zone

B) Limnetic zone

C) Profundal zone

D) Benthic zone

66. The major reservoir of carbon in the carbon cycle is:

A) The atmosphere

B) Living organisms

C) Oceans

D) Fossil fuels and rocks

67. The process of converting atmospheric nitrogen gas into a usable form for plants is called:

- A) Denitrification
- B) Nitrogen fixation
- C) Ammonification
- D) Nitrification

68. Which of the following is a greenhouse gas?

- A) Oxygen (O₂)
- B) Nitrogen (N₂)
- C) Methane (CH₄)
- D) Argon (Ar)

69. The primary cause of acid rain is the release of:

- A) Carbon dioxide and methane
- B) Sulfur dioxide and nitrogen oxides
- C) Chlorofluorocarbons (CFCs)
- D) Ozone and carbon monoxide

70. The depletion of the ozone layer is primarily caused by:

- A) Carbon dioxide
- B) Methane
- C) Chlorofluorocarbons (CFCs)
- D) Sulfur dioxide

71. Eutrophication of water bodies is caused by an excess of:

- A) Oxygen
- B) Carbon dioxide
- C) Phosphates and nitrates
- D) Heavy metals

72. A biological indicator of water pollution is:

- A) High pH level
- B) Presence of high levels of dissolved oxygen
- C) Presence of coliform bacteria
- D) Clear water

73. The term "biodiversity" refers to:

- A) The number of species in a specific area
- B) The variety of life at genetic, species, and ecosystem levels
- C) The total number of individual organisms in an area
- D) The number of habitats in a region

74. The species that are most vulnerable to extinction are those that:

- A) Have a broad habitat range
- B) Have a high reproductive rate
- C) Have a narrow habitat and specialized diet
- D) Are generalist species

75. A "hotspot" of biodiversity is defined as a region that:

- A) Has a large number of endemic species and has lost a significant amount of its habitat
 - B) Is the hottest place on Earth
 - C) Has the largest human population
 - D) Contains the highest number of individuals of a single species
76. The IUCN Red List is primarily a:
- A) List of endangered habitats
 - B) List of threatened and extinct species
 - C) List of national parks
 - D) List of invasive species
77. An endemic species is one that:
- A) Is found worldwide
 - B) Is found only in a particular geographical area
 - C) Is found in high numbers
 - D) Is introduced to a new area
78. An invasive species is one that:
- A) Is native to an area and provides a benefit to the ecosystem
 - B) Is introduced and causes harm to the ecosystem, economy, or human health
 - C) Is a keystone species
 - D) Is an endangered species
79. The principle of sustainable development aims to:
- A) Maximize economic growth at any cost
 - B) Use resources at a rate that can be maintained without depleting them for future generations
 - C) Stop all human activities that affect the environment
 - D) Focus only on environmental protection, ignoring human needs
80. A "biosphere reserve" is divided into zones. In which zone is the most intensive human activity allowed?
- A) Core zone
 - B) Buffer zone
 - C) Transition zone
 - D) All zones are equally protected
81. The main objective of a national park is to:
- A) Allow for the sustainable harvesting of natural resources
 - B) Protect the ecosystem and provide for public recreation and education
 - C) Promote tourism and commercial activities
 - D) Create a controlled environment for research only
82. A "sanctuary" differs from a "national park" mainly because in a sanctuary:
- A) No human activity is allowed
 - B) The focus is on protecting a particular species or habitat
 - C) Private ownership is not allowed

D) The area is smaller

83. The term "Ecological Footprint" is a measure of:

A) The size of an animal's home range

B) The area of land and water required to support a person's lifestyle

C) The depth of a forest floor

D) The amount of carbon in the soil

84. Which of the following is a renewable resource?

A) Coal

B) Petroleum

C) Solar energy

D) Natural gas

85. Which of the following is a non-renewable resource?

A) Wind energy

B) Biomass

C) Geothermal energy

D) Fossil fuels

86. The primary cause of deforestation in the tropics is:

A) Forest fires

B) Urbanization

C) Conversion of land for agriculture (e.g., cattle ranching, soy, palm oil)

D) Mining activities

87. Desertification is the process by which:

A) Deserts are converted into forests

B) Fertile land becomes desert-like due to human activities and climate change

C) The area of a desert shrinks

D) Soil becomes more fertile

88. The term "biomagnification" refers to the:

A) Increase in the size of organisms over time

B) Increase in concentration of a pollutant as it moves up the food chain

C) Increase in the total mass of organisms in an ecosystem

D) Decrease in biodiversity in a food web

89. The main component of municipal solid waste in most countries is:

A) Plastic

B) Metal

C) Paper and other organic materials

D) Glass

90. The most environmentally friendly way to manage waste is:

A) Incineration

B) Landfilling

C) Reduce, Reuse, and Recycle

D) Deep-sea disposal

91. A "keystone species" is one that:

- A) Is the most abundant species in an ecosystem
- B) Has a disproportionately large effect on its ecosystem relative to its abundance
- C) Is the largest organism in an ecosystem
- D) Is found only in a specific geological layer

92. Which of the following is an example of a mutualistic relationship?

- A) A lion hunting a zebra
- B) A tick feeding on a dog
- C) A bee pollinating a flower
- D) A fox and a rabbit competing for food

93. The process by which a population increases in size due to a high birth rate and low death rate, leading to a rapid increase, is known as:

- A) Logistic growth
- B) Exponential growth
- C) Linear growth
- D) Negative growth

94. Which of the following is a negative effect of dams and reservoirs on the environment?

- A) Increased flood control
- B) Generation of hydroelectric power
- C) Displacement of communities and loss of aquatic habitats
- D) Provision of water for irrigation

95. The "tragedy of the commons" describes a situation where:

- A) A shared resource is managed sustainably by a community
- B) Individuals acting independently and rationally deplete a shared resource
- C) A common resource is privatized
- D) Government regulations effectively protect a common resource

96. The primary cause of the current mass extinction event is:

- A) Asteroids
- B) Volcanic eruptions
- C) Human activities
- D) Climate change from natural cycles

97. Which of the following is a form of ex-situ conservation?

- A) National park
- B) Wildlife sanctuary
- C) A botanical garden or a zoo
- D) Biosphere reserve

98. Soil erosion is primarily caused by:

- A) Excessive use of fertilizers
- B) Overgrazing and deforestation
- C) Planting of cover crops

D) Contour ploughing

99. Smog is formed by the reaction of sunlight with:

A) Carbon dioxide and water vapor

B) Nitrous oxides and volatile organic compounds (VOCs)

C) Methane and ozone

D) Sulfur dioxide and soot

100. Which international agreement was designed to phase out the production of ozone-depleting substances?

A) Kyoto Protocol

B) Paris Agreement

C) Montreal Protocol

D) Basel Convention

ANSWER KEY OF ENVIRONMENTAL BIOLOGY

Q	A	Q	A
1	B	51	C
2	C	52	B
3	C	53	C
4	B	54	B
5	B	55	C
6	B	56	C
7	D	57	C
8	B	58	A
9	C	59	B
10	B	60	C
11	C	61.	C
12	D	62	B
13	B	63	B
14	C	64	C
15	B	65	B
16	C	66	D
17	D	67	B
18	B	68	C
19	C	69	B
20	C	70	C
21	A	71	C
22	B	72	C
23	C	73	B
24	A	74	C

25	C	75	A
26	C	76	B
27	B	77	B
28	B	78	B
29	B	79	B
30	B	80	C
31	C	81	B
32	B	82	B
33	D	83	B
34	B	84	C
35	A	85	D
36	B	86	C
37	B	87	B
38	B	88	B
39	B	89	C
40	C	90	C
41	B	91	B
42	B	92	C
43	D	93	B
44	C	94	C
45	C	95	B
46	C	96	C
47	B	97	C
48	A	98	B
49	B	99	B
50	C	100	C

HERE ARE 100 MCQS COVERING PHYCOLOGY (ALGAE), BRYOLOGY (MOSSES, LIVERWORTS & HORNWORTS), AND MICROBIOLOGY. THE ANSWER KEY IS PROVIDED AT THE END.

1. Phycology is the scientific study of:

- A) Fungi
- B) Algae
- C) Bacteria
- D) Mosses

2. Algae are primarily:

- A) Prokaryotic
- B) Eukaryotic
- C) Multicellular only
- D) Non-photosynthetic

3. Which pigment is characteristic of green algae?

- A) Phycoerythrin
- B) Chlorophyll a and b
- C) Fucoxanthin
- D) Anthocyanin

4. Red algae contain the pigment:

- A) Phycoerythrin
- B) Chlorophyll b
- C) Carotene
- D) Xanthophyll

5. Brown algae contain the pigment:

- A) Fucoxanthin
- B) Phycoerythrin
- C) Chlorophyll b
- D) Anthocyanin

6. What is the primary storage carbohydrate in red algae?

- A) Cellulose
- B) Laminarin
- C) Mannitol
- D) Floridean starch

7. What is the major storage carbohydrate in brown algae?

- A) Chrysolaminarin
- B) Starch
- C) Laminarin
- D) Cellulose

8. Algae store food mainly as:

- A) Laminarin or Floridean starch

- B) Glycogen
- C) Starch
- D) Sucrose

9. Diatoms are classified under:

- A) Chlorophyta
- B) Phaeophyta
- C) Rhodophyta
- D) Chrysophyta

10. Diatoms store food as:

- A) Starch
- B) Laminarin
- C) Glycogen
- D) Oil

11. Blue-green algae are also called:

- A) Phaeophyta
- B) Chlorophyta
- C) Rhodophyta
- D) Cyanobacteria

12. Which algae are nitrogen-fixing?

- A) *Nostoc*
- B) *Chlorella*
- C) *Laminaria*
- D) *Gelidium*

13. *Volvox* is an example of:

- A) Colonial algae
- B) Unicellular algae
- C) Filamentous algae
- D) Multicellular brown algae

14. *Spirogyra* shows:

- A) Colonial red algae
- B) Unicellular blue-green algae
- C) Filamentous green algae
- D) Multicellular brown algae

15. Which algae are used in agar production?

- A) *Chlorella*
- B) *Laminaria*
- C) *Gelidium* and *Gracilaria*
- D) *Spirogyra*

16. Carrageenan is obtained from:

- A) Brown algae
- B) Blue-green algae

C) Green algae

D) Red algae

17. Brown algae are commonly found in:

A) Freshwater

B) Desert rocks

C) Terrestrial

D) Marine environment

18. The largest algae are:

A) *Chlorella*

B) *Spirogyra*

C) *Laminaria* and *Macrocystis*

D) *Nostoc*

19. What is the cell wall of most algae made of?

A) Chitin

B) Lignin

C) Cellulose

D) Silica

20. What pigment is responsible for the red color in red algae?

A) Chlorophyll a

B) Phycoerythrin

C) Lutein

D) Fucoxanthin

21. What is the primary pigment in brown algae?

A) Astaxanthin

B) Fucoxanthin

C) Chlorophyll

D) Phycocyanin

22. Green algae are considered ancestors of:

A) Fungi

B) Bryophytes and higher plants

C) Algae only

D) Pteridophytes

23. Algae produce oxygen through:

A) Respiration

B) Fermentation

C) Photosynthesis

D) Decomposition

24. Which type of algae is known for its high protein content?

A) Red Algae

B) *Chlorella*

C) Kelp

D) *Spirulina*

25. What is the most diverse group of algae?

- A) Green Algae
- B) Brown Algae
- C) Red Algae
- D) Diatoms

26. What makes diatoms important in aquatic food chains?

- A) They are a major food source for marine organisms
- B) They produce harmful toxins
- C) They accelerate eutrophication
- D) They contribute to coral bleaching

27. What type of algae forms the base of most aquatic food chains?

- A) Green algae
- B) Diatoms
- C) Brown algae
- D) Red algae

28. In which habitat are most types of algae found?

- A) Aquatic
- B) Mountain
- C) Forest
- D) Desert

29. What is the term for a collection of unicellular algae?

- A) Phytoplankton
- B) Seaweed
- C) Coral
- D) Seagrass

30. Which group of algae is responsible for harmful algal blooms (HABs)?

- A) Green algae
- B) Red algae
- C) Brown algae
- D) Dinoflagellates

31. Algae reproduce asexually by:

- A) Fragmentation
- B) Zoospores
- C) Both A and B
- D) Seeds

32. Red algae store food as:

- A) Starch
- B) Laminarin
- C) Glycogen

D) Floridean starch

33. *Nostoc* and *Anabaena* are examples of:

A) Green algae

B) Blue-green algae

C) Brown algae

D) Red algae

34. The word "Phycology" is derived from which language?

A) Latin

B) Greek

C) English

D) French

35. "Phykos" means:

A) Grass

B) Seaweed

C) Sea

D) Plant

36. Bryology is the study of:

A) Mosses and liverworts

B) Algae

C) Fungi

D) Gymnosperms

37. Bryophytes are:

A) Vascular plants

B) Flowering plants

C) Non-vascular plants

D) Gymnosperms

38. Bryophytes are called "amphibians of the plant kingdom" because:

A) They require water to complete their life cycle

B) They require land to complete their life cycle

C) They can live in both air and water

D) They have vascular tissues

39. The dominant phase in bryophytes is:

A) Gametophyte

B) Sporophyte

C) Seedling

D) Zygote

40. Bryophytes require water for:

A) Fertilization

B) Photosynthesis

C) Respiration

D) Transpiration

41. Mosses belong to the phylum:

- A) Bryophyta
- B) Hepaticophyta
- C) Pteridophyta
- D) Anthophyta

42. Liverworts belong to the phylum:

- A) Hepaticophyta
- B) Bryophyta
- C) Pteridophyta
- D) Chlorophyta

43. Hornworts belong to the phylum:

- A) Bryophyta
- B) Pteridophyta
- C) Hepaticophyta
- D) Anthocerotophyta

44. Bryophytes lack:

- A) Chlorophyll
- B) Xylem and phloem
- C) Cell wall
- D) Nucleus

45. Rhizoids in bryophytes help in:

- A) Photosynthesis
- B) Anchoring
- C) Fertilization
- D) Spore dispersal

46. Bryophytes reproduce by:

- A) Seeds
- B) Cones
- C) Flowers
- D) Spores

47. The gametophyte of bryophytes is:

- A) Small and short-lived
- B) Sporophytic
- C) Non-photosynthetic
- D) Large and persistent

48. The sporophyte of bryophytes is:

- A) Independent
- B) Photosynthetic
- C) Dependent on gametophyte
- D) Multicellular

49. Antheridia produce:

- A) Eggs
- B) Zygotes
- C) Spores
- D) Sperm

50. Archegonia produce:

- A) Spores
- B) Sperm
- C) Eggs
- D) Gametes

51. Fertilization in bryophytes requires:

- A) Wind
- B) Self-pollination
- C) Animals
- D) Water

52. *Sphagnum* moss is important as:

- A) Food only
- B) Medicine only
- C) Fuel and horticulture
- D) Rubber production

53. Mosses are mainly:

- A) Marine
- B) Aquatic
- C) Terrestrial
- D) Epiphytic

54. Liverworts have body called:

- A) Stem
- B) Leafy shoots
- C) Rhizome
- D) Thallus

55. In mosses, the leafy gametophyte is:

- A) Protonema
- B) Archegonia
- C) Antheridia
- D) Sporophyte

56. The sporophyte of bryophytes consists of:

- A) Spores only
- B) Root, stem, leaf
- C) Antheridia, archegonia
- D) Foot, seta, capsule

57. Mosses are used as:

- A) Bioindicators of air pollution

- B) Fiber source
- C) Medicine only
- D) Rubber production

58. Asexual reproduction in bryophytes occurs by:

- A) Flowers
- B) Spores only
- C) Seeds
- D) Gemmae

59. *Marchantia* reproduces asexually by:

- A) Buds
- B) Gemmae
- C) Spores
- D) Conidia

60. The capsule in mosses produces:

- A) Spores
- B) Gametes
- C) Zygotes
- D) Gemmae

61. Bryophytes require a moist environment because:

- A) They need water for fertilization
- B) They lack cuticle
- C) They lack chlorophyll
- D) They have seeds

62. Rhizoids are:

- A) True roots
- B) Root-like structures
- C) Stem structures
- D) Leaf structures

63. Who is regarded as the "Father of Indian Bryology"?

- A) Prof. K.C. Mehta
- B) Prof. D.D. Pant
- C) Prof. S.R. Kashyap
- D) Prof. P.N. Mehra

64. Heteromorphic alternation of generation is commonly found in:

- A) Algae
- B) Fungi
- C) Bryophyta
- D) All the above

65. Venter is the part of:

- A) Sporogonium
- B) Sporangium

C) Antheridium

D) Archegonium

66. In which group would you place a plant which produces spores and embryos but lacks seeds and vascular tissue?

A) Fungi

B) Bryophytes

C) Pteridophytes

D) Gymnosperms

67. Which is not a characteristic feature of Bryophyta?

A) Motile sperms

B) Presence of archegonium

C) Water essential for fertilization

D) Photosynthetically independent sporophyte

68. Bryophytes differ from pteridophytes in:

A) Swimming anterozoids

B) An independent gametophyte

C) Archegonia

D) Lack of vascular tissue

69. Elaters are present in sporogonium of:

A) *Riccia*

B) *Marchantia*

C) *Selaginella*

D) *Dawsonia*

70. Gametophytic generation is dominant in:

A) Pteridophyta

B) Bryophyta

C) Angiosperms

D) Gymnosperms

71. Who is known as the father of microbiology?

A) Ivanoski

B) Nageli

C) Koch

D) Leeuwenhoek

72. Which of these bacterial components is least likely to contain useful antigens?

A) Cell wall

B) Flagella

C) Ribosomes

D) Capsule

73. Which of the following contains structures composed of N-acetylmuramic acid and N-acetylglucosamine?

- A) Mycoplasmas
- B) Amoeba
- C) *E. coli*
- D) Spheroplast

74. The association of endotoxin in gram-negative bacteria is due to the presence of:

- A) Steroids
- B) Peptidoglycan
- C) Lipopolysaccharides
- D) Polypeptide

75. The prokaryotic cell membrane:

- A) Contains metabolic enzymes
- B) Is selectively permeable
- C) Regulates the entry and exit of materials
- D) Contains proteins and phospholipids

76. Which of the statements regarding gram staining is wrong?

- A) *Mycobacterium tuberculosis* stains blue because of the thick lipid layer
- B) *Streptococcus pyogenes* stains blue because of a thick peptidoglycan layer
- C) *Escherichia coli* stains pink because of a thin peptidoglycan layer
- D) *Mycoplasma pneumoniae* is not visible in Gram's stain because it has no cell wall

77. Which of the following is not a recognised cause of diarrhoea?

- A) *Vibrio cholerae*
- B) *Escherichia coli*
- C) *Clostridium perfringens*
- D) *Enterococcus faecalis*

78. Which of the following is a gram-positive eubacterium?

- A) *Actinomyces*
- B) *Clostridium*
- C) *Rhizobium*
- D) *Clostridium, Actinomyces*

79. Which of the following microorganisms is not responsible for urinary tract infection?

- A) *Proteus mirabilis*
- B) *Escherichia coli*
- C) *Klebsiella pneumoniae*
- D) *Bacteroides fragilis*

80. Which of the following is diagnosed by serologic means?

- A) Actinomycosis
- B) Q-fever
- C) Pulmonary tuberculosis

D) Gonorrhea

81. Diarrhoea is not caused by:

A) *Shigella dysenteriae*

B) *Streptococcus pyogenes*

C) *Clostridium difficile*

D) *Salmonella enteritidis*

82. The coagulase test is done to differentiate:

A) *Staphylococcus aureus* from *Staphylococcus epidermidis*

B) *Staphylococcus epidermidis* from *Neisseria meningitidis*

C) *Streptococcus pyogenes* from *Enterococcus faecalis*

D) *Streptococcus pyogenes* from *Staphylococcus aureus*

83. Prokaryotic cells are more resistant to osmotic shock than eukaryotic cells because:

A) Their cell wall is composed of peptidoglycan

B) They are selectively permeable

C) They contain osmoregulating porins

D) They block water molecules from entering the cell

84. The bacterial genus where sterols are present in the cell membrane is:

A) *Vibrio*

B) *Mycoplasma*

C) *Escherichia*

D) *Chlamydia*

85. The bacterium that infects other gram-negative bacteria is:

A) *Proteus mirabilis*

B) *Haemophilus influenza*

C) *Bdellovibrio*

D) *Pseudomonas putida*

86. Which phage is used for phage display technique?

A) T7

B) M13

C) λ -phage

D) $\phi 6$

87. Identify the term that describes rod-shaped bacteria:

A) Coccus

B) Bacillus

C) Spirilli

D) Longus

88. Spherical bacterium is called:

A) Bacillus

B) Coccus

C) Spirillum

D) Vibrio

89. Who first developed solid media culture techniques using agar as a solidifying agent?

A) Robert Koch

B) Louis Pasteur

C) Joseph Lister

D) Alexander Fleming

90. The study of fungi is known as:

A) Phycology

B) Mycology

C) Palynology

D) Bryology

91. The study of pollen grains, spores and microscopic planktonic organisms is called:

A) Phycology

B) Mycology

C) Palynology

D) Bryology

92. Which of the following is a prokaryotic microorganism?

A) Amoeba

B) Yeast

C) Bacteria

D) Paramecium

93. The genetic material in bacteria is:

A) Linear DNA in nucleus

B) Circular DNA in nucleoid

C) RNA only

D) Multiple linear chromosomes

94. Plasmids are:

A) Essential for bacterial survival

B) Extra-chromosomal DNA

C) Viral particles

D) Ribosomal subunits

95. The process by which bacteria transfer genetic material through direct cell-to-cell contact is:

A) Transformation

B) Transduction

C) Conjugation

D) Transfection

96. Which of the following is an obligate intracellular parasite?

- A) Bacteria
- B) Virus
- C) Fungi
- D) Protozoa

97. The protein coat of a virus is called:

- A) Capsid
- B) Envelope
- C) Cell wall
- D) Membrane

98. Which of the following is used to sterilize media and equipment in microbiology?

- A) Autoclave
- B) Oven
- C) Incubator
- D) Centrifuge

99. The optimum temperature for the growth of most pathogenic bacteria is:

- A) 4°C
- B) 25°C
- C) 37°C
- D) 60°C

100. Which of the following is not a characteristic of viruses?

- A) They are acellular
- B) They contain DNA or RNA
- C) They can reproduce independently
- D) They are obligate intracellular parasites

ANSWER KEY OF 100 MCQS COVERING PHYCOLOGY (ALGAE), BRYOLOGY (MOSESSES, LIVERWORTS & HORNWORTS), AND MICROBIOLOGY

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	21	B	41	A	61	A	81	B
2	B	22	B	42	A	62	B	82	A
3	B	23	C	43	D	63	C	83	A
4	A	24	D	44	B	64	C	84	B
5	A	25	A	45	B	65	D	85	C
6	D	26	A	46	D	66	B	86	B
7	C	27	B	47	D	67	D	87	B
8	A	28	A	48	C	68	D	88	B
9	D	29	A	49	D	69	A	89	A
10	D	30	D	50	C	70	B	90	B

11	D	31	C	51	D	71	D	91	C
12	A	32	D	52	C	72	C	92	C
13	A	33	B	53	C	73	C	93	B
14	C	34	B	54	D	74	C	94	B
15	C	35	B	55	A	75	D	95	C
16	D	36	A	56	D	76	A	96	B
17	D	37	C	57	A	77	D	97	A
18	C	38	A	58	D	78	D	98	A
19	C	39	A	59	B	79	D	99	C
20	B	40	A	60	A	80	B	100	C

MULTIPLE CHOICE QUESTIONS (MCQS) FROM SUSTAINABLE DEVELOPMENT GOALS (SDGS), ARTIFICIAL INTELLIGENCE (AI) IN BOTANY, AND FORENSIC BOTANY (100 MCQS WITH ANSWER KEY)

1. How many Sustainable Development Goals (SDGs) were adopted by the United Nations?

- A. 15
- B. 16
- C. 17
- D. 18

2. The SDGs were adopted in:

- A. 2010
- B. 2012
- C. 2015
- D. 2020

3. SDG 1 focuses on:

- A. Quality Education
- B. No Poverty
- C. Zero Hunger
- D. Good Health

4. SDG 2 aims to achieve:

- A. Affordable Energy
- B. Zero Hunger
- C. Clean Water
- D. Climate Action

5. SDG 3 is related to:

- A. Health and Well-being
- B. Industry
- C. Oceans
- D. Justice

6. SDG 4 focuses on:

- A. Climate Action
- B. Education

C. Water Conservation

D. Biodiversity

7. SDG 5 promotes:

A. Gender Equality

B. Economic Growth

C. Responsible Consumption

D. Partnerships

8. SDG 6 concerns:

A. Energy

B. Water and Sanitation

C. Forests

D. Employment

9. SDG 7 advocates:

A. Renewable Energy

B. Urbanization

C. Innovation

D. Education

10. SDG 13 is:

A. Climate Action

B. Life Below Water

C. Peace and Justice

D. Partnerships

11. SDG 14 focuses on:

A. Marine Ecosystems

B. Forest Ecosystems

C. Agriculture

D. Industry

12. SDG 15 deals with:

A. Life on Land

B. Oceans

C. Cities

D. Poverty

13. Which SDG promotes sustainable cities?

A. SDG 8

B. SDG 10

C. SDG 11

D. SDG 12

14. SDG 12 concerns:

A. Responsible Consumption and Production

B. Education

C. Equality

D. Water

15. SDG 16 focuses on:

A. Climate

B. Peace, Justice and Strong Institutions

C. Oceans

D. Energy

16. SDG 17 emphasizes:

- A. Technology
- B. Partnerships
- C. Agriculture
- D. Biodiversity

17. The SDGs are also known as:

- A. Agenda 2020
- B. Agenda 2030
- C. Agenda 2040
- D. Agenda 2050

18. Which SDG addresses inequalities?

- A. SDG 10
- B. SDG 11
- C. SDG 12
- D. SDG 13

19. Sustainable development balances:

- A. Social, Economic, Environmental aspects
- B. Politics only
- C. Industry only
- D. Economy only

20. SDGs replaced:

- A. Kyoto Protocol
- B. Millennium Development Goals
- C. Paris Agreement
- D. Biodiversity Convention

21. Climate change is primarily addressed in:

- A. SDG 12
- B. SDG 13
- C. SDG 14
- D. SDG 15

22. Which organization adopted SDGs?

- A. WHO
- B. UNESCO
- C. United Nations
- D. IMF

23. SDG 8 promotes:

- A. Decent Work and Economic Growth
- B. Equality
- C. Biodiversity
- D. Water

24. SDG 9 concerns:

- A. Industry, Innovation and Infrastructure
- B. Oceans
- C. Hunger
- D. Health

25. SDG 11 aims for:

- A. Sustainable Cities and Communities
- B. Equality
- C. Water
- D. Education

26. Poverty eradication is central to:

- A. SDG 1
- B. SDG 5
- C. SDG 8
- D. SDG 13

27. Which SDG promotes clean energy?

- A. SDG 6
- B. SDG 7
- C. SDG 8
- D. SDG 9

28. Sustainable agriculture is emphasized in:

- A. SDG 2
- B. SDG 7
- C. SDG 11
- D. SDG 16

29. Gender equality is:

- A. SDG 3
- B. SDG 4
- C. SDG 5
- D. SDG 6

30. Safe drinking water is a target under:

- A. SDG 4
- B. SDG 6
- C. SDG 8
- D. SDG 12

31. Which SDG focuses on reducing inequalities?

- A. SDG 10
- B. SDG 9
- C. SDG 11
- D. SDG 12

32. Biodiversity conservation contributes most directly to:

- A. SDG 15
- B. SDG 5
- C. SDG 8
- D. SDG 10

33. Oceans and marine resources relate to:

- A. SDG 13
- B. SDG 14
- C. SDG 15
- D. SDG 16

34. Sustainable development seeks to meet:

- A. Present needs without compromising future generations
- B. Current economic goals only

C. Industrial growth only

D. Political goals

35. The SDGs target year is:

A. 2025

B. 2030

C. 2040

D. 2050

36. AI stands for:

A. Automated Intelligence

B. Artificial Intelligence

C. Artificial Integration

D. Advanced Information

37. AI in botany is mainly used for:

A. Plant data analysis

B. Cooking

C. Banking

D. Marketing

38. Machine learning is a subset of:

A. Physics

B. AI

C. Chemistry

D. Ecology

39. AI can identify plants using:

A. Leaf images

B. Soil only

C. Water only

D. Fertilizers

40. Which technology is widely used for plant disease detection?

A. Deep Learning

B. GPS

C. Spectroscopy only

D. PCR only

41. CNN stands for:

A. Convolutional Neural Network

B. Central Neural Node

C. Computer Network Node

D. Cellular Neural Network

42. AI can help improve:

A. Crop productivity

B. Air pollution

C. Urbanization

D. Mining

43. Plant phenotyping refers to:

A. Measuring plant traits

B. DNA extraction

C. Pollination

D. Herbarium storage

44. Remote sensing data are often analyzed using:

- A. AI algorithms
- B. Hand lens
- C. Microscope only
- D. Vernier caliper

45. AI can assist in:

- A. Species identification
- B. Literature review
- C. Climate prediction
- D. All of these

46. Deep learning uses:

- A. Artificial neural networks
- B. Magnets
- C. Batteries
- D. Microscopes

47. Herbarium digitization benefits from:

- A. AI image recognition
- B. Pollination
- C. Fermentation
- D. Grafting

48. AI-based agriculture is called:

- A. Smart Farming
- B. Organic Farming
- C. Dry Farming
- D. Terrace Farming

49. AI can predict:

- A. Crop yield
- B. Plant diseases
- C. Weather impacts
- D. All of these

50. Which programming language is commonly used in AI?

- A. Python
- B. Latin
- C. Arabic
- D. Urdu

71. Forensic botany is the application of:

- A. Botany to legal investigations
- B. Chemistry to medicine
- C. Physics to engineering
- D. Zoology to fisheries

72. Forensic botany helps in:

- A. Crime investigation
- B. Plant breeding
- C. Food processing
- D. Irrigation

73. Pollen analysis in forensic science is called:

- A. Palynology
- B. Cytology
- C. Histology
- D. Ecology

74. Plant evidence can link:

- A. Suspects to crime scenes
- B. Plants to insects
- C. Soil to water
- D. Animals to habitats

75. Wood identification is useful in:

- A. Illegal logging investigations
- B. Plant breeding
- C. Tissue culture
- D. Pollination

76. Seeds found at crime scenes can provide:

- A. Investigative clues
- B. Nutrition only
- C. Medicines
- D. Fertilizers

77. Forensic botany is useful in:

- A. Homicide investigations
- B. Drug trafficking cases
- C. Wildlife crimes
- D. All of these

78. Plant DNA analysis helps:

- A. Identify plant species
- B. Increase rainfall
- C. Improve soil fertility
- D. Control pests

79. Growth rings are studied in:

- A. Dendrochronology
- B. Cytology
- C. Histology
- D. Taxonomy

80. Dendrochronology determines:

- A. Age of trees
- B. Plant diseases
- C. DNA sequences
- D. Photosynthesis rate

81. Illegal narcotic plants can be identified through:

- A. Forensic botany
- B. Ecology
- C. Zoology
- D. Hydrology

82. Plant fragments on clothing may indicate:

- A. Presence at a location
- B. Food habits

- C. Age
- D. Occupation

83. Which plant material is highly resistant and useful as evidence?

- A. Pollen grains
- B. Flowers
- C. Fruits
- D. Leaves

84. Cannabis identification is a task of:

- A. Forensic botany
- B. Agronomy
- C. Entomology
- D. Limnology

85. Forensic palynology studies:

- A. Pollen and spores
- B. Roots
- C. Fruits
- D. Wood

86. Plant evidence is considered:

- A. Trace evidence
- B. Physical evidence
- C. Biological evidence
- D. All of these

87. DNA fingerprinting can identify:

- A. Plant origin
- B. Rainfall
- C. Soil pH
- D. Temperature

88. Which plant structure is most commonly examined in palynology?

- A. Pollen grain
- B. Root hair
- C. Stem
- D. Bark

89. Forensic botany contributes to:

- A. Environmental crime investigation
- B. Taxonomy only
- C. Plant breeding
- D. Horticulture

90. Plant succession may help estimate:

- A. Postmortem interval
- B. Plant height
- C. Yield
- D. Germination

91. Soil containing plant remains can provide:

- A. Geographical evidence
- B. Nutritional value
- C. Medicine
- D. Fuel

92. Botanical evidence is valuable because:

- A. It is often overlooked
- B. It can persist for long periods
- C. It is species-specific
- D. All of these

93. Forensic botany is interdisciplinary because it combines:

- A. Botany and Law
- B. Botany and Crime Science
- C. Genetics and Ecology
- D. All of these

94. Plant DNA markers include:

- A. SSRs
- B. RAPD
- C. AFLP
- D. All of these

95. Which evidence can help trace geographic origin?

- A. Pollen
- B. DNA
- C. Seeds
- D. All of these

96. Forensic botanists often work with:

- A. Police agencies
- B. Courts
- C. Investigators
- D. All of these

97. Botanical evidence must maintain:

- A. Chain of custody
- B. Fertility
- C. Photosynthesis
- D. Germination

98. The first step in forensic plant analysis is:

- A. Proper collection of evidence
- B. DNA sequencing
- C. Reporting
- D. Publishing

99. Forensic botany contributes significantly to:

- A. Criminal justice
- B. Plant pathology
- C. Horticulture
- D. Forestry

100. Forensic botany is increasingly important due to:

- A. Advanced DNA technologies
- B. Environmental crimes
- C. Improved analytical methods
- D. All of these

ANSWER KEY OF MULTIPLE-CHOICE QUESTIONS (MCQS) FROM SUSTAINABLE DEVELOPMENT GOALS (SDGS), ARTIFICIAL INTELLIGENCE (AI) IN BOTANY, AND FORENSIC BOTANY

Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	26	A	51	A	76	A
2	C	27	B	52	B	77	D
3	B	28	A	53	C	78	A
4	B	29	C	54	D	79	A
5	A	30	B	55	A	80	A
6	B	31	A	56	B	81	A
7	A	32	A	57	C	82	A
8	B	33	B	58	D	83	A
9	A	34	A	59	A	84	A
10	A	35	B	60	B	85	A
11	A	36	B	61	C	86	D
12	A	37	A	62	D	87	A
13	C	38	B	63	A	88	A
14	A	39	A	64	B	89	A
15	B	40	A	65	C	90	A
16	B	41	A	66	D	91	A
17	B	42	A	67	A	92	D
18	A	43	A	68	B	93	D
19	A	44	A	69	C	94	D
20	B	45	D	70	D	95	D
21	B	46	A	71	A	96	D
22	C	47	A	72	A	97	A
23	A	48	A	73	A	98	A
24	A	49	D	74	A	99	A
25	A	50	A	75	A	100	D

By Dr. Saadullah Khan

TITLE: PLANT SYSTEMATICS (COURSE CONTENTS)

1. Plant Systematics is the study of:

- A. Plant physiology
- B. Plant diversity and its classification
- C. Plant diseases
- D. Plant breeding

Ans: B

2. The father of modern plant taxonomy is:

- A. Aristotle
- B. Theophrastus
- C. Carolus Linnaeus
- D. Darwin

Ans: C

3. The basic unit of classification is:

- A. Genus
- B. Family
- C. Species
- D. Order

Ans: C

4. Binomial nomenclature was proposed by:

- A. Engler & Prantl
- B. Linnaeus
- C. Hutchinson
- D. Bentham & Hooker

Ans: B

5. ICN stands for:

- A. International Code of Nomenclature
- B. International Code of Nomenclature for Algae, Fungi, and Plants
- C. Indian Council of Nomenclature
- D. International Committee of Names

Ans: B

6. The principle of 'Priority' in ICN means:

- A. Latest name is accepted
- B. Earliest validly published name has priority
- C. Most used name has priority
- D. Name given by Linnaeus has priority

Ans: B

7. A 'Type specimen' is:

- A. Most beautiful specimen
- B. The specimen to which the name is permanently attached
- C. Fossil specimen
- D. Cultivated specimen

Ans: B

8. Systematics includes:

- A. Classification only
- B. Identification only
- C. Nomenclature only
- D. Identification, Nomenclature & Classification

Ans: D

9. The category Taxon means:

- A. Taxonomic rank
- B. Any taxonomic group
- C. Taxonomist
- D. Taxonomic key

Ans: B

10. Phylogeny refers to:

- A. Evolutionary history of a group
- B. Structure of plant
- C. Function of plant
- D. Ecology of plant

Ans: A

11. Artificial system of classification is based on:

- A. One or two characters only
- B. Many natural characters
- C. Phylogeny
- D. DNA sequences

Ans: A

12. Natural system of classification was given by:

- A. Linnaeus
- B. Bentham & Hooker
- C. Hutchinson
- D. Both B & C

Ans: D

13. The suffix '-aceae' is used for:

- A. Order
- B. Family
- C. Genus
- D. Species

Ans: B

14. The suffix '-ales' is used for:

- A. Family
- B. Order
- C. Class
- D. Division

Ans: B

15. Holotype, Isotype, Lectotype are terms related to:

- A. Ecology
- B. Nomenclature
- C. Physiology
- D. Anatomy

Ans: B

16. Linnaean system is based on:

- A. Number of stamens
- B. Number of carpels
- C. Both A & B
- D. Embryology

Ans: C

17. In Bentham & Hooker's system, Gymnosperms are placed:

- A. Before Dicots
- B. After Dicots
- C. After Monocots
- D. With Monocots

Ans: B

18. Hutchinson's system is called:

- A. Phylogenetic system
- B. Artificial system
- C. Natural system
- D. Numerical system

Ans: A

19. Engler & Prantl considered as primitive:

- A. Monocots
- B. Dicots
- C. Amentiferae
- D. Rosales

Ans: C

20. APG IV is a:

- A. Artificial system
- B. Molecular phylogenetic system
- C. Natural system
- D. Numerical system

Ans: B

21. Which system places Monocots before Dicots?

- A. Bentham & Hooker
- B. Engler & Prantl
- C. Hutchinson
- D. Linnaeus

Ans: C

22. Natural system of classification is based on:

- A. One character
- B. All available characters
- C. Economic importance
- D. Habitat

Ans: B

23. In Bentham & Hooker, Monochlamydeae includes:

- A. Polypetalae
- B. Gamopetalae
- C. Incomplete flowers
- D. Monocots

Ans: C

24. Cladistics is based on:

- A. Overall similarity
- B. Shared derived characters
- C. Economic value
- D. Habitat

Ans: B

25. Phenetics uses:

- A. DNA only
- B. Numerical taxonomy
- C. Fossils only
- D. Ecology only

Ans: B

26. Family Brassicaceae is characterized by:

- A. Papilionaceous corolla
- B. Tetradynamous stamens
- C. Inferior ovary
- D. Ligulate florets

Ans: B

27. Mustard family' is:

- A. Fabaceae
- B. Poaceae
- C. Brassicaceae
- D. Malvaceae

Ans: C

28. Leguminosae has types of subfamilies:

- A. 2
- B. 3
- C. 4
- D. 5

Ans: B = Papilionoideae, Caesalpinioideae, Mimosoideae

29. Papilionaceous corolla is found in:

- A. Brassicaceae

- B. Fabaceae
- C. Asteraceae
- D. Solanaceae

Ans: B

30. Family Poaceae is characterized by:

- A. Spadix inflorescence
- B. Spikelet inflorescence
- C. Capitulum
- D. Umbel

Ans: B

31. Inferior ovary is a feature of:

- A. Rosaceae
- B. Cucurbitaceae
- C. Brassicaceae
- D. Fabaceae

Ans: B

32. Solanaceae has:

- A. Actinomorphic, bisexual, superior ovary
- B. Zygomorphic, inferior ovary
- C. Unilocular ovary
- D. Apocarpous gynoecium

Ans: A

33. Family Malvaceae is known for:

- A. Mucilaginous hairs, monadelphous stamens
- B. Tetradynamous stamens
- C. Syngenesious stamens
- D. Diadelphous stamens

Ans: A

34. Capitulum inflorescence is found in:

- A. Poaceae
- B. Asteraceae
- C. Brassicaceae
- D. Fabaceae

Ans: B

35. Syngenesious stamens are characteristic of:

- A. Malvaceae
- B. Asclepiadaceae
- C. Solanaceae
- D. Liliaceae

Ans: B

36. Liliaceae has:

- A. Trimerous flowers, superior ovary

- B. Pentamerous flowers, inferior ovary
- C. Tetramerous flowers
- D. Zygomorphic flowers

Ans: A

37. Economic importance of Poaceae:

- A. Pulses
- B. Cereals
- C. Oilseeds
- D. Spices

Ans: B

38. Family Cucurbitaceae is recognized by:

- A. Tendrils, inferior ovary
- B. Latex
- C. Stinging hairs
- D. Nectar spur

Ans: A

39. Rutaceae is known for:

- A. Citrus fruits
- B. Mango
- C. Banana
- D. Wheat

Ans: A

40. Akenes type of inflorescences are found in:

- A. Poaceae
- B. Asteraceae
- C. Brassicaceae
- D. Fabaceae

Ans: B

41. Herbarium is collection of specimens a:

- A. Botanical Garden
- B. Collection of dried, pressed plant specimens
- C. Museum
- D. Seed bank

Ans: B

42. Kew Herbarium is located in:

- A. USA
- B. UK
- C. India
- D. Pakistan

Ans: B

43. Flora is a book containing:

- A. Plant anatomy

- B. List of plants of an area with description
- C. Plant physiology
- D. Plant diseases

Ans: B

44. Dichotomous key is used for:

- A. Plant growth
- B. Identification of plants
- C. Classification
- D. Nomenclature

Ans: B

45. Cytotaxonomy uses data from:

- A. Chromosomes
- B. Leaves
- C. Roots
- D. Seeds

Ans: A

46. Chemotaxonomy is based on:

- A. Chemical constituents
- B. Morphology
- C. Anatomy
- D. Embryology

Ans: A

47. DNA barcoding uses:

- A. rbcL, matK genes
- B. Chlorophyll genes
- C. Protein genes
- D. Enzyme genes

Ans: A

48. The process of mounting specimen on herbarium sheet is called:

- A. Poisoning
- B. Mounting
- C. Fumigation
- D. Labeling

Ans: B

49. HgCl₂ is used in herbaria for:

- A. Pressing
- B. Poisoning against insects
- C. Drying
- D. Mounting

Ans: B

50. Holotype + Paratype + Syntype =

- A. Types of keys

- B. Types of specimens
- C. Types of families
- D. Types of leaves

Ans: B

51. Monophyletic group includes:

- A. Common ancestor + all descendants
- B. Common ancestor + some descendants
- C. No common ancestor
- D. Convergent group

Ans: A

52. Polyphyletic group is:

- A. Natural group
- B. Artificial group
- C. Monophyletic
- D. Paraphyletic

Ans: B

53. APG system is based mainly on:

- A. Morphology
- B. Molecular data
- C. Embryology
- D. Palynology

Ans: B

54. Basionym refers to:

- A. Original name of a taxon
- B. Latest name
- C. Invalid name
- D. Synonym

Ans: A

55. Autonym is automatically created when:

- A. New species is described
- B. Intraspecific taxon is described
- C. Family is described
- D. Genus is described

Ans: B

56. Effective publication according to ICN excludes:

- A. Printed journals
- B. Theses
- C. Books
- D. e-PDF with ISSN

Ans: B

57. Tautonym is:

- A. Genus and species name same, e.g. *Pica pica*

- B. Different names
- C. Invalid name
- D. Conserved name

Ans: A = Not allowed in botany, allowed in zoology

58. Numerical taxonomy is also called:

- A. Cladistics
- B. Phenetics
- C. Phylogenetics
- D. Chemotaxonomy

Ans: B

59. Endemic species means:

- A. Found everywhere
- B. Restricted to a particular area
- C. Extinct species
- D. Cultivated species

Ans: B

60. The largest plant family is:

- A. Fabaceae
- B. Poaceae
- C. Orchidaceae
- D. Asteraceae

Ans: D

-ANSWER KEY - ALL 60 MCQS

1-B, 2-C, 3-C, 4-B, 5-B, 6-B, 7-B, 8-D, 9-B, 10-A

11-A, 12-D, 13-B, 14-B, 15-B, 16-C, 17-B, 18-A, 19-C, 20-B

21-C, 22-B, 23-C, 24-B, 25-B, 26-B, 27-C, 28-B, 29-B, 30-B

31-B, 32-A, 33-A, 34-B, 35-B, 36-A, 37-B, 38-A, 39-A, 40-B

41-B, 42-B, 43-B, 44-B, 45-A, 46-A, 47-A, 48-B, 49-B, 50-B

51-A, 52-B, 53-B, 54-A, 55-B, 56-B, 57-A, 58-B, 59-B, 60-D

PLANT STRESS PHYSIOLOGY (COURSE CONTENTS) MCQs

1. Plant stress physiology deals with:

- A. Plant growth under ideal conditions
- B. Plant responses to adverse environmental conditions
- C. Plant breeding only
- D. Plant taxonomy

Ans: B

2. Biotic stress is caused by:

- A. Drought, salinity, heat
- B. Pathogens, insects, weeds
- C. Mineral deficiency
- D. Light

Ans: B

3. Abiotic stress includes:

- A. Fungal attack
- B. Drought, salinity, temperature extremes
- C. Virus infection
- D. Nematodes

Ans: B

4. Stress is defined as any factor that:

- A. Increases yield
- B. Limits plant growth and productivity
- C. Has no effect
- D. Increases photosynthesis only

Ans: B

5. Eustress refers to:

- A. Harmful stress
- B. Beneficial stress at low intensity
- C. Lethal stress
- D. No stress

Ans: B

6. Acute stress is:

- A. Long-term, mild stress
- B. Short-term, severe stress
- C. Chronic stress
- D. No stress

Ans: B

7. Chronic stress leads to:

- A. Adaptation
- B. Plant death immediately
- C. Increased growth
- D. No change

Ans: A

8. Primary stress is directly caused by:

- A. ROS production
- B. The stress factor itself, e.g. water deficit
- C. Hormones
- D. Antioxidants

Ans: B

9. Secondary stress includes:

- A. Drought
- B. Oxidative stress due to ROS
- C. Salinity
- D. Heat

Ans: B

10. Plant stress index is often measured by:

- A. Chlorophyll content
- B. Membrane Stability Index MSI
- C. Leaf number
- D. Plant height

Ans: B

11. Drought stress primarily causes:

- A. Water excess
- B. Water deficit in plant tissues
- C. Nutrient excess
- D. High temperature only

Ans: B

12. Leaf water potential decreases under:

- A. Drought
- B. Flooding
- C. Optimum irrigation
- D. High humidity

Ans: A

13. Stomatal closure under drought reduces:

- A. Transpiration & CO₂ uptake
- B. Photosynthesis only
- C. Respiration only
- D. Nothing

Ans: A

14. ABA increases under drought to induce:

- A. Stomatal opening
- B. Stomatal closure
- C. Leaf expansion
- D. Root death

Ans: B

15. Osmotic adjustment is achieved by accumulation of:

- A. Proline, glycine betaine, sugars
- B. Water
- C. Chlorophyll
- D. Oxygen

Ans: A

16. Relative Water Content RWC is calculated as:

- A. $[\text{FW}-\text{DW}]/[\text{TW}-\text{DW}] \times 100$
- B. $[\text{TW}-\text{FW}]/[\text{TW}-\text{DW}] \times 100$
- C. $[\text{FW}/\text{TW}] \times 100$
- D. $[\text{DW}/\text{FW}] \times 100$

Ans: A _FW=Fresh, TW=Turgid, DW=Dry weight_

17. Drought tolerant plants show:

- A. Low root:shoot ratio
- B. High root:shoot ratio
- C. No roots
- D. Only shoots

Ans: B

18. Wilting point is when:

- A. Plant cannot recover even after watering
- B. Plant is fully turgid
- C. Stomata open
- D. Photosynthesis max

Ans: A

19. Xerophytes avoid drought by:

- A. Succulence, thick cuticle
- B. Large thin leaves
- C. High stomatal density
- D. No adaptation

Ans: A

20. Drought escape means:

- A. Completing life cycle before drought
- B. Tolerating drought
- C. Avoiding drought
- D. Dying

Ans: A

21. Salinity stress causes:

- A. Osmotic stress + ion toxicity
- B. Only water excess
- C. Only CO₂ deficit
- D. No effect

Ans: A

22. Main toxic ions in saline soil are:

- A. Na^+ and Cl^-
- B. K^+ and Ca^{2+}
- C. Mg^{2+} and Fe^{2+}
- D. N and P

Ans: A

23. Halophytes can grow in:

- A. Fresh water
- B. Saline soils $>200 \text{ mM NaCl}$
- C. No soil
- D. Acid soil only

Ans: B

24. Salt exclusion occurs at:

- A. Roots
- B. Leaves
- C. Flowers
- D. Seeds

Ans: A

25. Salt tolerance is improved by accumulation of:

- A. Proline, GB in cytoplasm
- B. Na^+ in cytoplasm
- C. Cl^- in nucleus
- D. Water in vacuole only

Ans: A

26. Glycophytes are:

- A. Salt tolerant
- B. Salt sensitive plants
- C. Aquatic plants
- D. Xerophytes

Ans: B

27. $\text{ECe} > 4 \text{ dS/m}$ soil is called:

- A. Normal soil
- B. Saline soil
- C. Acid soil
- D. Alkaline soil

Ans: B

28. SOS pathway in plants regulates:

- A. Salt stress signaling
- B. Drought only
- C. Heat only
- D. Light

Ans: A

29. Heat stress causes:

- A. Protein denaturation
- B. Increased photosynthesis
- C. Stomatal opening always
- D. No damage

Ans: A

30. Heat shock proteins HSPs function as:

- A. Chaperones to prevent protein aggregation
- B. Enzymes
- C. Pigments
- D. Hormones

Ans: A

31. Chilling injury occurs below:

- A. 0°C
- B. 10-15°C for tropical plants
- C. 30°C
- D. 40°C

Ans: B

32. Frost tolerance involves:

- A. Accumulation of cryoprotectants
- B. More water
- C. Less solutes
- D. No adaptation

Ans: A

33. Flooding stress causes:

- A. Hypoxia/anoxia in roots
- B. Oxygen excess
- C. Drought
- D. Salinity only

Ans: A

34. Aerenchyma formation helps in:

- A. Drought
- B. Flooding, by oxygen transport
- C. Salinity
- D. Heat

Ans: B

35. Photoinhibition is damage to:

- A. PSII under high light
- B. PSI only
- C. Mitochondria
- D. Nucleus

Ans: A

36. UV-B stress increases production of:

- A. Flavonoids & phenolics
- B. Chlorophyll
- C. Water
- D. Oxygen

Ans: A

37. ROS stands for:

- A. Reactive Oxygen Species
- B. Reduced Oxygen Supply
- C. Root Osmotic Stress
- D. Rapid Oxidation System

Ans: A

38. Common ROS are:

- A. $O_2^{\bullet-}$, H_2O_2 , $\bullet OH$, HO_2
- B. CO_2 , N_2
- C. H_2O , O_2
- D. CH_4

Ans: A

39. Lipid peroxidation is measured by:

- A. MDA content
- B. Chlorophyll
- C. Proline
- D. Starch

Ans: A

40. H_2O_2 is detoxified by:

- A. Catalase CAT, Ascorbate peroxidase APX
- B. SOD only
- C. Proline
- D. ABA

Ans: A

41. Superoxide radical $O_2^{\bullet-}$ is dismutated by:

- A. SOD
- B. CAT
- C. POD
- D. GR

Ans: A

42. Oxidative burst occurs during:

- A. Biotic stress
- B. Abiotic stress
- C. Both A & B
- D. No stress

Ans: C

43. Cell membrane damage is indicated by:

- A. Increased electrolyte leakage
- B. Decreased leakage
- C. No leakage
- D. Increased turgor

Ans: A

44. Protein carbonylation is a marker of:

- A. Oxidative protein damage
- B. Protein synthesis
- C. DNA damage
- D. Lipid synthesis

Ans: A

45. Non-enzymatic antioxidants include:

- A. Ascorbate, Glutathione, Tocopherol
- B. SOD, CAT
- C. Proline only
- D. ABA

Ans: A

46. Enzymatic antioxidants include:

- A. SOD, CAT, POD, APX, GR
- B. Proline
- C. Glycine betaine
- D. Sugars

Ans: A

47. Ascorbate-Glutathione cycle is important for:

- A. H₂O₂ scavenging
- B. CO₂ fixation
- C. N fixation
- D. Water uptake

Ans: A

48. Proline acts as:

- A. Osmolyte, ROS scavenger, protein stabilizer
- B. Hormone only
- C. Pigment
- D. Toxin

Ans: A

49. Glycine betaine GB is a:

- A. Quaternary ammonium compound
- B. Amino acid
- C. Sugar
- D. Lipid

Ans: A

50. Polyamines help in:

- A. Membrane stabilization under stress
- B. Membrane breakdown
- C. No role
- D. Photosynthesis only

Ans: A

51. Tocopherol or Vitamin E protects:

- A. Lipids from peroxidation
- B. Proteins
- C. DNA
- D. Water

Ans: A

52. Carotenoids protect by:

- A. Quenching singlet oxygen
- B. Producing ROS
- C. No role
- D. Increasing light

Ans: A

53. Key hormone for drought & salinity response:

- A. ABA
- B. GA
- C. Cytokinin
- D. Auxin

Ans: A

54. Ethylene increases under:

- A. Flooding stress
- B. Drought only
- C. Cold only
- D. No stress

Ans: A

55. Salicylic acid SA is involved in:

- A. Biotic stress tolerance
- B. Drought only
- C. Salinity only
- D. No role

Ans: A

56. Jasmonic acid JA is linked to:

- A. Herbivory defense
- B. Photosynthesis
- C. Water uptake
- D. N fixation

Ans: A

57. Ca^{2+} acts as:

- A. Second messenger in stress signaling
- B. Primary nutrient only
- C. Toxin
- D. Pigment

Ans: A

58. MAPK cascade is involved in:

- A. Stress signal transduction
- B. Photosynthesis
- C. Respiration
- D. Growth only

Ans: A

59. Drought avoidance is by:

- A. Deep roots, leaf rolling
- B. Succulence
- C. Early maturity
- D. A & C

Ans: D

60. Drought tolerance is by:

- A. Osmotic adjustment, antioxidant defense
- B. Escaping drought
- C. Avoiding drought
- D. No mechanism

Ans: A

61. TTC test measures:

- A. Root activity/dehydrogenase activity
- B. Leaf area
- C. Chlorophyll
- D. Stomata

Ans: A

62. F_v/F_m ratio is used to assess:

- A. PSII efficiency/photoinhibition
- B. Stomatal conductance
- C. RWC
- D. Proline

Ans: A

63. WUE is:

- A. Biomass or yield per unit water used
- B. Water applied
- C. Transpiration rate
- D. Leaf number

Ans: A

64. Priming improves stress tolerance by:

- A. Pre-exposure to mild stress
- B. No effect
- C. Killing plant
- D. Increasing stress

Ans: A

65. Transgenic approach for stress tolerance often uses genes for:

- A. DREB, LEA, SOS1, NHX1
- B. Chlorophyll
- C. Cellulose
- D. Starch

Ans: A

ANSWER KEY OF ALL 65 MCQs

1-B, 2-B, 3-B, 4-B, 5-B, 6-B, 7-A, 8-B, 9-B, 10-B

11-B, 12-A, 13-A, 14-B, 15-A, 16-A, 17-B, 18-A, 19-A, 20-A

21-A, 22-A, 23-B, 24-A, 25-A, 26-B, 27-B, 28-A, 29-A, 30-A

31-B, 32-A, 33-A, 34-B, 35-A, 36-A, 37-A, 38-A, 39-A, 40-A

41-A, 42-C, 43-A, 44-A, 45-A, 46-A, 47-A, 48-A, 49-A, 50-A

51-A, 52-A, 53-A, 54-A, 55-A, 56-A, 57-A, 58-A, 59-D, 60-A

61-A, 62-A, 63-A, 64-A, 65-A

MCQS PLANT PHYSIOLOGY (COURSE CONTENTS)
--

1. The term 'water potential' was introduced by:

- A. Sachs
- B. Slatyer & Taylor
- C. Dixon
- D. J.C. Bose

Ans: B

2. Osmotic potential is always:

- A. Positive
- B. Negative
- C. Zero
- D. Variable

Ans: B

3. $\Psi_w = \Psi_s + \Psi_p + \Psi_g$. In most plant cells Ψ_g is:

- A. Large positive
- B. Large negative
- C. Negligible
- D. Zero

Ans: C

4. Plasmolysis occurs when a cell is placed in:

- A. Hypotonic solution
- B. Hypertonic solution
- C. Isotonic solution
- D. Pure water

Ans: B

5. Root pressure is responsible for:

- A. Guttation
- B. Transpiration
- C. Photosynthesis
- D. Respiration

Ans: A

6. Cohesion-Tension Theory explains:

- A. Ascent of sap
- B. Phloem loading
- C. Stomatal opening
- D. Seed germination

Ans: A

7. Stomatal opening is due to:

- A. Loss of turgor in guard cells
- B. Gain of turgor in guard cells
- C. Death of guard cells
- D. Calcium influx

Ans: B

8. Anti-transpirants reduce:

- A. Photosynthesis only
- B. Transpiration
- C. Respiration
- D. Mineral uptake

Ans: B

9. The instrument used to measure water potential is:

- A. Porometer
- B. Psychrometer
- C. Potometer
- D. Auxanometer

Ans: B

10. Apoplast pathway is through:

- A. Cytoplasm
- B. Cell wall & intercellular spaces
- C. Plasmodesmata
- D. Vacuole

Ans: B

11. Which one is a micronutrient?

- A. Nitrogen
- B. Potassium
- C. Boron
- D. Calcium

Ans: C

12. Molybdenum micronutrient is essential for:

- A. Chlorophyll synthesis
- B. Nitrogen fixation
- C. Cell wall formation
- D. Photosynthesis

Ans: B

13. Chlorosis of young leaves indicates deficiency of:

- A. N, K, Mg
- B. Fe, Mn, Zn, Cu
- C. P, S
- D. Ca, B

Ans: B

14. Hydroponics was developed by:

- A. Arnon & Stout
- B. Sachs
- C. Haberlandt
- D. Knop

Ans: B

15. Nitrate reductase enzyme requires:

- A. Fe
- B. Mo
- C. Cu
- D. Zn

Ans: B

16. Luxury consumption refers to:

- A. Deficiency symptom
- B. Uptake of nutrients more than required
- C. Toxicity
- D. Leaching

Ans: B

17. Plants absorb most minerals in the form of:

- A. Organic
- B. Ionic
- C. Gaseous
- D. Elemental

Ans: B

18. Critical concentration is the level of nutrient:

- A. Causing toxicity
- B. Below which yield is reduced
- C. At saturation
- D. Zero

Ans: B

19. Photosystem II is also called:

- A. P700
- B. P680
- C. P690
- D. P710

Ans: B

20. The primary electron acceptor in PSII is:

- A. Plastoquinone
- B. Pheophytin
- C. Ferredoxin
- D. Cytochrome b6f

Ans: B

21. Oxygen evolved during photosynthesis comes from:

- A. CO₂
- B. H₂O
- C. Chlorophyll
- D. Glucose

Ans: B

22. Calvin cycle operates in:

- A. Grana
- B. Stroma
- C. Cytoplasm
- D. Mitochondria

Ans: B

23. C4 plants species have Kranz anatomy. Example:

- A. Wheat
- B. Maize
- C. Pea
- D. Sunflower

Ans: B

24. PEP carboxylase is found in:

- A. C3 plants
- B. C4 plants
- C. CAM plants
- D. Both B & C

Ans: D

25. Photorespiration is high in:

- A. C4 plants
- B. CAM plants
- C. C3 plants
- D. All plants

Ans: C

26. RuBisCO has high affinity for:

- A. O₂
- B. CO₂
- C. Both equally
- D. N₂

Ans: B

27. Cyclic photophosphorylation produces:

- A. ATP only
- B. NADPH only
- C. ATP + NADPH
- D. O₂ only

Ans: A

28. The first stable product of C3 cycle is:

- A. PGA
- B. OAA
- C. Malate
- D. PEP

Ans: A

29. Z-scheme shows:

- A. Electron flow in photosynthesis
- B. Calvin cycle
- C. Glycolysis
- D. TCA cycle

Ans: A

30. CAM plants open stomata at:

- A. Day
- B. Night
- C. Both
- D. Never

Ans: B

31. Glycolysis occurs in:

- A. Mitochondria
- B. Cytoplasm
- C. Chloroplast
- D. Nucleus

Ans: B

32. Krebs cycle occurs in:

- A. Matrix of mitochondria
- B. Inner membrane
- C. Cytoplasm
- D. Stroma

Ans: A

33. Net ATP from one glucose in aerobic respiration:

- A. 2
- B. 4
- C. 36-38
- D. 12

Ans: C

34. Terminal electron acceptor in aerobic respiration is:

- A. CO₂
- B. O₂
- C. NAD⁺
- D. FAD

Ans: B

35. R.Q. = 1 for:

- A. Fats
- B. Proteins
- C. Carbohydrates
- D. Organic acids

Ans: C

36. Cyanide-resistant respiration is via:

- A. Cytochrome pathway
- B. Alternative oxidase pathway
- C. Glycolysis
- D. PPP

Ans: B

37. Pentose Phosphate Pathway produces:

- A. ATP
- B. NADPH + Ribose-5-P
- C. O₂
- D. CO₂ only

Ans: B

38. Fermentation yields:

- A. 36 ATP
- B. 2 ATP
- C. 38 ATP
- D. 0 ATP

Ans: B

39. Auxin was discovered by:

- A. Went
- B. Kurosawa
- C. Skoog
- D. Thimann

Ans: A

40. Gibberellins growth promoting hormone cause:

- A. Dwarfism
- B. Bolting & internode elongation
- C. Leaf fall
- D. Dormancy

Ans: B

41. Cytokinins PGP phytohormone promote:

- A. Senescence
- B. Cell division
- C. Abscission
- D. Dormancy

Ans: B

42. Absciscic Acid ABA is called stress hormone because:

- A. Promotes growth
- B. Induces stomatal closure under drought
- C. Breaks dormancy
- D. Causes bolting

Ans: B

43. Ethylene PGR is a:

- A. Acid
- B. Gas
- C. Protein
- D. Lipid

Ans: B

44. Triple response' is shown by ethylene in:

- A. Dicot seedlings
- B. Monocot seedlings
- C. Mature plants
- D. Roots only

Ans: A

45. Florigen is related to:

- A. Fruit ripening
- B. Flowering
- C. Root growth
- D. Leaf fall

Ans: B

46. Brassinosteroids promote:

- A. Senescence
- B. Cell elongation & division
- C. Dormancy
- D. Abscission

Ans: B

47. Proline accumulates under:

- A. Flooding
- B. Drought & salinity
- C. High light
- D. Low temperature

Ans: B

48. MDA is a marker of:

- A. Photosynthesis
- B. Lipid peroxidation
- C. Respiration
- D. Protein synthesis

Ans: B

49. Photoperiodism was discovered in:

- A. Tobacco
- B. Pea
- C. Maize
- D. Rice

Ans: A

50. Long Day Plants flower when:

- A. Day length < critical period
- B. Day length > critical period
- C. No light
- D. Continuous dark

Ans: B

51. Vernalization is:

- A. Low temp treatment to induce flowering
- B. High temp treatment
- C. Light treatment
- D. Water treatment

Ans: A

52. Senescence is delayed by:

- A. Ethylene
- B. ABA
- C. Cytokinin
- D. Auxin

Ans: C

53. Seed and bud dormancy is broken by:

- A. ABA
- B. Gibberellin
- C. Ethylene
- D. Both B & C

Ans: D

54. Phytochrome exists in the forms of:

- A. Pr
- B. Pfr
- C. Pr & Pfr
- D. None of these

Ans: C = Pr & Pfr

55. Phloem loading occurs via:

- A. Apoplast
- B. Symplast
- C. Both a & b
- D. Neither

Ans: C

56. Mass flow hypothesis explains:

- A. Xylem transport
- B. Phloem transport
- C. Root pressure
- D. Diffusion

Ans: B

57. Sieve tube elements lack:

- A. Cell wall
- B. Nucleus at maturity
- C. Cytoplasm
- D. Plasmodesmata

Ans: B

58. The rate of photosynthesis is maximum in:

- A. Blue light
- B. Red light
- C. Green light
- D. Yellow light

Ans: B

59. C3 plants are saturated at the light intensity:

- A. High
- B. Low
- C. Very high
- D. Zero

Ans: B

60. Emerson enhancement effect proves:

- A. One photosystem
- B. Two photosystems
- C. No photosystem
- D. CAM

Ans: B

ANSWER KEY - ALL 60 MCQS

1-B, 2-B, 3-C, 4-B, 5-A, 6-A, 7-B, 8-B, 9-B, 10-B

11-C, 12-B, 13-B, 14-B, 15-B, 16-B, 17-B, 18-B, 19-B, 20-B

21-B, 22-B, 23-B, 24-D, 25-C, 26-B, 27-A, 28-A, 29-A, 30-B

31-B, 32-A, 33-C, 34-B, 35-C, 36-B, 37-B, 38-B, 39-A, 40-B

41-B, 42-B, 43-B, 44-A, 45-B, 46-B, 47-B, 48-B, 49-A, 50-B

51-A, 52-C, 53-D, 54-B, 55-C, 56-B, 57-B, 58-B, 59-B, 60-B

MCQS MEDICINAL PLANTS (COURSE CONTENTS)

1. WHO defines medicinal plants as plants which:

- A. Have ornamental value
- B. Contain substances used for therapeutic purposes
- C. Are used as food only
- D. Are poisonous

Ans: B

2. Pharmacognosy means:

- A. Study of plant physiology
- B. Study of crude drugs from natural sources
- C. Study of plant anatomy
- D. Study of plant ecology

Ans: B

3. The term 'Materia Medica' refers to:

- A. Plant pathology
- B. Collection of drugs and their properties
- C. Soil science
- D. Plant breeding

Ans: B

4. Active constituents in medicinal plants are called:

- A. Primary metabolites
- B. Secondary metabolites
- C. Minerals
- D. Water

Ans: B

5. Ethnobotany is the study of:

- A. Plant taxonomy
- B. Relationship between people and plants
- C. Plant diseases
- D. Plant genetics

Ans: B

6. Crude drug is obtained from plants in:

- A. Purified form
- B. Unprocessed natural form
- C. Synthetic form
- D. Semi-synthetic form

Ans: B

7. Ayurveda originated in:

- A. China
- B. India
- C. Egypt
- D. Greece

Ans: B

8. Unani system of medicine was developed by:

- A. Greeks & Arabs
- B. Chinese
- C. Indians
- D. Egyptians

Ans: A

9. Alkaloids are characterized by:

- A. Presence of nitrogen
- B. Absence of nitrogen
- C. Presence of sulfur
- D. Presence of phosphorus

Ans: A

10. Quinine, an antimalarial drug, is obtained from:

- A. *Papaver somniferum*
- B. *Cinchona officinalis*
- C. *Atropa belladonna*
- D. *Digitalis purpurea*

Ans: B

11. Morphine is extracted from:

- A. Opium poppy
- B. Belladonna
- C. Cinchona
- D. Rauwolfia

Ans: A

12. Glycosides on hydrolysis yield:

- A. Sugar + non-sugar aglycone
- B. Only sugar
- C. Only protein
- D. Only fat

Ans: A

13. Digoxin is a cardiac glycoside from:

- A. *Digitalis purpurea*
- B. *Aloe vera*
- C. *Mentha*
- D. *Eucalyptus*

Ans: A

14. Tannins are used as:

- A. Analgesic
- B. Astringent
- C. Stimulant
- D. Antibiotic

Ans: B

15. Essential oils are:

- A. Fixed oils
- B. Volatile oils
- C. Mineral oils
- D. Synthetic oils

Ans: B

16. Menthol is obtained from:

- A. *Eucalyptus*
- B. *Mentha piperita*
- C. *Ocimum*
- D. *Cinnamomum*

Ans: B

17. Reserpine, used for hypertension, is from:

- A. *Rauwolfia serpentina*
- B. *Withania somnifera*
- C. *Azadirachta indica*
- D. *Cassia*

Ans: A

18. Saponins produce foam because they are:

- A. Alkaloids
- B. Surface active agents
- C. Glycosides
- D. Tannins

Ans: B

19. Botanical name of Neem is:

- A. *Ocimum sanctum*
- B. *Azadirachta indica*
- C. *Aloe vera*
- D. *Cassia fistula*

Ans: B

20. Tulsi or Holy Basil is:

- A. *Azadirachta indica*
- B. *Ocimum sanctum*
- C. *Mentha arvensis*
- D. *Eucalyptus sp*

Ans: B

21. *Aloe vera* is used for:

- A. Diabetes
- B. Skin burns & wound healing
- C. Malaria
- D. Hypertension

Ans: B

22. Active constituent of *Withania somnifera* Ashwagandha is:

- A. Quinine
- B. Withanolides
- C. Morphine
- D. Reserpine

Ans: B

23. *Senna* (*Cassia angustifolia*) leaves are used as:

- A. Antipyretic
- B. Laxative
- C. Analgesic
- D. Antibiotic

Ans: B

24. Eucalyptus oil is used as:

- A. Antiseptic & expectorant
- B. Laxative
- C. Sedative
- D. Cardiac tonic

Ans: A

25. Ginger rhizome is:

- A. *Zingiber officinale*
- B. *Curcuma longa*
- C. *Allium sativum*
- D. *Piper nigrum*

Ans: A

26. Curcumin is the active principle of:

- A. Ginger
- B. Turmeric
- C. Garlic
- D. Black pepper

Ans: B

27. Garlic has antimicrobial activity due to:

- A. Curcumin
- B. Allicin
- C. Menthol
- D. Quinine

Ans: B

28. Psyllium husk is obtained from:

- A. *Plantago ovata*
- B. Isabgol
- C. Both A & B
- D. Cassia

Ans: C

29. Black pepper is:

- A. *Capsicum nigrum*_
- B. *Capsicum annuum*
- C. *Zingiber sp*
- D. *Curcuma sp*

Ans: A

30. Belladonna contains:

- A. Atropine
- B. Quinine
- C. Morphine
- D. Caffeine

Ans: A

31. Ephedra is source of:

- A. Ephedrine
- B. Morphine
- C. Quinine
- D. Digoxin

Ans: A

32. Brahmi, used for memory, is:

- A. *Bacopa monnieri*
- B. *Centella asiatica*
- C. Both A & B
- D. *Ocimum sp*

Ans: C

33. Artemisinin, antimalarial, is from:

- A. *Artemisia annua*
- B. *Cinchona*
- C. *Papaver*_
- D. *Atropa*

Ans: A

34. Stevia is used as:

- A. Antibiotic
- B. Natural sweetener
- C. Laxative
- D. Analgesic

Ans: B

35. Fenugreek seeds are:

- A. *Trigonella foenum-graecum*_
- B. *Coriandrum sativum*_
- C. *Cuminum cyminum*_
- D. *Foeniculum*_

Ans: A

36. Family Solanaceae gives:

- A. Atropine, Hyoscyamine
- B. Quinine
- C. Morphine
- D. Reserpine

Ans: A

37. Family Rubiaceae is source of:

- A. _Cinchona_
- B. _Papaver_
- C. _Digitalis_
- D. _Rauwolfia_

Ans: A

38. Apocynaceae includes:

- A. _Rauwolfia serpentina_
- B. _Digitalis_
- C. _Mentha_
- D. _Eucalyptus_

Ans: A

39. Lamiaceae family is known for:

- A. Aromatic essential oils
- B. Alkaloids
- C. Glycosides
- D. Tannins

Ans: A

40. Family Fabaceae gives:

- A. Senna
- B. Quinine
- C. Morphine
- D. Digoxin

Ans: A

41. Poisonous plant of Solanaceae:

- A. *Datura stramonium*
- B. *Ocimum basilicum*
- C. *Mentha viridis*
- D. *Aloe vera*

Ans: A

42. Myrtaceae family gives:

- A. *Eucalyptus globulus*
- B. *Mentha viridis*
- C. *Ocimum basilicum*
- D. *Cassia fistula*

Ans: A

43. Zingiberaceae includes:

- A. Ginger & Turmeric
- B. Mint & Basil
- C. Senna & Cassia
- D. Cinchona

Ans: A

44. Plantago family is:

- A. Plantaginaceae
- B. Poaceae
- C. Fabaceae
- D. Solanaceae

Ans: A

45. Asteraceae gives medicinal plant:

- A. *Artemisia annua*
- B. *Cinchona sp*
- C. *Papaver sp*
- D. *Rauwolfia sp*

Ans: A

46. Abrin is a toxic protein from:

- A. *Abrus precatorius*
- B. *Datura strumarium*
- C. *Papaver somnifera*
- D. *Atropa balllona*

Ans: A

47. Nicotine is obtained from:

- A. *Nicotiana tabacum*
- B. *Cannabis*
- C. *Papaver*
- D. *Datura*

Ans: A

48. Colchicine is obtained from

- A. *Colchicum autumnale*
- B. *Crocus*
- C. *Saffron*
- D. *Allium*

Ans: A

49. Cannabis sativa contains:

- A. Morphine
- B. THC
- C. Quinine
- D. Reserpine

Ans: B

50. Adulteration of Senna with:

- A. _Cassia occidentalis_
- B. _Plantago_
- C. _Mentha_
- D. _Eucalyptus_

Ans: A

51. Belladonna poisoning causes:

- A. Bradycardia
- B. Tachycardia, dry mouth, mydriasis
- C. Diarrhea
- D. Hypotension

Ans: B

52. LD50 means:

- A. Lethal dose for 50% population
- B. Effective dose
- C. Therapeutic dose
- D. Toxic dose

Ans: A

53. Medicinal plants should be harvested at:

- A. Vegetative stage only
- B. Time of maximum active constituent
- C. Seed stage only
- D. Any time

Ans: B

54. Drying of medicinal plants is done to:

- A. Increase moisture
- B. Prevent microbial growth & enzymatic decay
- C. Reduce weight only
- D. Change color

Ans: B

55. IUCN Red List category 'Endangered' means:

- A. Extinct
- B. High risk of extinction in wild
- C. Common
- D. Cultivated

Ans: B

56. Ex-situ conservation means:

- A. In natural habitat
- B. Outside natural habitat like botanical garden
- C. No conservation
- D. In forest only

Ans: B

57. Pakistan Medicinal Plant Database is maintained by:

- A. PCSIR
- B. WHO
- C. NASA
- D. FAO

Ans: A

58. Organic cultivation of medicinal plants avoids:

- A. Chemical fertilizers & pesticides
- B. Water
- C. Sunlight
- D. Soil

Ans: A

59. Good Agricultural Practices for medicinal plants is called:

- A. GAP
- B. GMP
- C. GLP
- D. GHP

Ans: A

60. Shinwari et al. 2002 is famous for work on:

- A. Pakistani medicinal plants ethnobotany
- B. Plant physiology
- C. Plant breeding
- D. Soil science

Ans: A

ANSWER KEY of ALL 60 MCQs

1-B, 2-B, 3-B, 4-B, 5-B, 6-B, 7-B, 8-A, 9-A, 10-B

11-A, 12-A, 13-A, 14-B, 15-B, 16-B, 17-A, 18-B, 19-B, 20-B

21-B, 22-B, 23-B, 24-A, 25-A, 26-B, 27-B, 28-C, 29-A, 30-A

31-A, 32-C, 33-A, 34-B, 35-A, 36-A, 37-A, 38-A, 39-A, 40-A

41-A, 42-A, 43-A, 44-A, 45-A, 46-A, 47-A, 48-A, 49-B, 50-A

51-B, 52-A, 53-B, 54-B, 55-B, 56-B, 57-A, 58-A, 59-A, 60-A

Mycology & Plant Pathology

1. Mycology is the scientific study of:

- A. Algae
- B. Bacteria
- C. Fungi
- D. Viruses

2. The cell wall of most fungi is primarily composed of:

- A. Cellulose
- B. Chitin
- C. Peptidoglycan
- D. Lignin

3. Fungi are:

- A. Autotrophic organisms
- B. Chemosynthetic organisms
- C. Heterotrophic eukaryotes
- D. Photosynthetic organisms

4. Reserve food material in fungi is:

- A. Starch
- B. Glycogen
- C. Cellulose
- D. Sucrose

5. The thread-like structures that collectively form the fungal body are called:

- A. Rhizoids
- B. Hyphae
- C. Sporangioophores
- D. Conidia

6. A mass of hyphae is known as:

- A. Thallus
- B. Mycelium
- C. Sporangium
- D. Ascocarp

7. Septate hyphae are characterized by:

- A. Absence of nuclei
- B. Presence of cross walls
- C. Lack of cell walls
- D. Absence of cytoplasm

8. Coenocytic hyphae are:

- A. Septate
- B. Multinucleate without septa
- C. Uninucleate
- D. Non-living

9. Which of the following is a unicellular fungus?

- A. Aspergillus
- B. Penicillium

- C. Saccharomyces
- D. Rhizopus

10. Budding is the characteristic mode of reproduction in:

- A. Mucor
- B. Rhizopus
- C. Yeast
- D. Agaricus

11. Fungi absorb nutrients by:

- A. Photosynthesis
- B. Phagocytosis
- C. Absorption through the cell wall
- D. Chemosynthesis

12. Which pigment is absent in fungi?

- A. Melanin
- B. Carotenoids
- C. Chlorophyll
- D. Flavins

13. The principal mode of vegetative reproduction in fungi is:

- A. Fragmentation
- B. Pollination
- C. Fertilization
- D. Binary fission

14. Asexual spores produced inside a sac are called:

- A. Conidia
- B. Basidiospores
- C. Sporangiospores
- D. Ascospores

15. Conidia are produced:

- A. Inside sporangia
- B. On conidiophores
- C. Inside asci
- D. On basidia

16. Which is NOT an asexual spore?

- A. Conidium
- B. Zoospore
- C. Basidiospore
- D. Chlamydospore

17. Sexual reproduction in fungi generally involves:

- A. Plasmogamy
- B. Karyogamy
- C. Meiosis
- D. All of these

18. Fusion of cytoplasm during fungal sexual reproduction is called:

- A. Karyogamy
- B. Plasmogamy
- C. Meiosis
- D. Cytokinesis

19. Fusion of nuclei is known as:

- A. Cytogamy
- B. Plasmogamy
- C. Karyogamy
- D. Syngamy

20. The dikaryotic stage is characterized by:

- A. One nucleus per cell
- B. Two genetically distinct nuclei per cell
- C. No nucleus
- D. Four nuclei per cell

21. Which of the following fungi produces motile spores?

- A. Aspergillus
- B. Penicillium
- C. Chytrids
- D. Agaricus

22. The fungal plasma membrane contains:

- A. Cholesterol
- B. Ergosterol
- C. Sitosterol
- D. Lanosterol

23. Which environmental factor is most important for fungal growth?

- A. High salinity
- B. Moisture
- C. Intense sunlight
- D. High oxygen only

24. Which statement regarding fungi is correct?

- A. All fungi are pathogens.
- B. All fungi are multicellular.
- C. Fungi reproduce both sexually and asexually.
- D. Fungi contain chloroplasts.

25. Which scientist is regarded as the Father of Mycology?

- A. Anton de Bary
- B. Heinrich Anton de Bary
- C. Pier Antonio Micheli
- D. Robert Koch

26. Which fungal phylum is characterized by the production of motile zoospores?

- A. Ascomycota
- B. Basidiomycota
- C. Chytridiomycota
- D. Glomeromycota

27. Rhizopus belongs to:

- A. Chytridiomycota
- B. Mucoromycota (formerly Zygomycetes)
- C. Ascomycota
- D. Basidiomycota

28. Bread mold is commonly:

- A. Aspergillus niger
- B. Penicillium notatum
- C. Rhizopus stolonifer
- D. Agaricus bisporus

29. Sexual spores of Rhizopus are:

- A. Ascospores
- B. Basidiospores
- C. Zoospores
- D. Zygospores

30. The largest fungal phylum is:

- A. Chytridiomycota
- B. Basidiomycota
- C. Ascomycota
- D. Glomeromycota

31. Sac fungi belong to:

- A. Chytridiomycota
- B. Ascomycota
- C. Basidiomycota
- D. Oomycota

32. Ascospores are produced inside:

- A. Basidia
- B. Sporangia
- C. Asci
- D. Conidiophores

33. A closed ascocarp is called:

- A. Apothecium
- B. Perithecium
- C. Cleistothecium
- D. Basidiocarp

34. A flask-shaped ascocarp is:

- A. Apothecium
- B. Perithecium
- C. Cleistothecium
- D. Sorus

35. Cup-shaped ascocarps are:

- A. Perithecia
- B. Cleistothecia
- C. Apothecia
- D. Basidia

36. Penicillium reproduces asexually through:

- A. Zoospores
- B. Conidia
- C. Basidiospores
- D. Oospores

37. Aspergillus belongs to:

- A. Basidiomycota
- B. Chytridiomycota
- C. Ascomycota
- D. Glomeromycota

38. Mushrooms belong to:

- A. Ascomycota
- B. Basidiomycota
- C. Chytridiomycota
- D. Oomycota

39. Sexual spores of Basidiomycota are:

- A. Oospores
- B. Zygosporangia
- C. Basidiospores
- D. Conidia

40. Basidiospores are produced on:

- A. Asci
- B. Basidia
- C. Sporangia
- D. Conidiophores

41. Rust fungi belong to:

- A. Basidiomycota
- B. Ascomycota
- C. Chytridiomycota
- D. Glomeromycota

42. Smut fungi are classified under:

- A. Ascomycota
- B. Basidiomycota
- C. Oomycota
- D. Chytridiomycota

43. Puccinia graminis causes:

- A. Wheat smut
- B. Wheat rust
- C. Wheat blight
- D. Wheat wilt

44. Ustilago maydis causes:

- A. Corn smut
- B. Corn rust
- C. Corn blight
- D. Corn wilt

45. Arbuscular mycorrhizal fungi belong to:

- A. Glomeromycota
- B. Ascomycota
- C. Basidiomycota
- D. Chytridiomycota

46. Lichens are associations between:

- A. Fungus and bacterium
- B. Fungus and alga/cyanobacterium
- C. Alga and bacterium
- D. Fungus and virus

47. Which genus is famous for penicillin production?

- A. Rhizopus
- B. Aspergillus
- C. Penicillium
- D. Agaricus

48. Oomycetes differ from true fungi because their cell walls mainly contain:

- A. Chitin
- B. Cellulose
- C. Lignin
- D. Pectin only

49. Phytophthora infestans causes:

- A. Late blight of potato
- B. Rust of wheat
- C. Corn smut
- D. Loose smut of wheat

50. Which structure is commonly used in fungal identification?

- A. Stomata
- B. Conidia and spores
- C. Xylem vessels
- D. Root hairs

51. Plant pathology is the study of:

- A. Plant nutrition
- B. Plant diseases
- C. Plant breeding
- D. Plant taxonomy

52. The Father of Plant Pathology is:

- A. Robert Koch
- B. Louis Pasteur
- C. Anton de Bary
- D. Micheli

53. The disease triangle consists of:

- A. Host, pathogen, environment
- B. Soil, water, air
- C. Root, stem, leaf
- D. Fungus, bacterium, virus

54. A pathogen is:

- A. Beneficial microorganism
- B. Disease-causing agent
- C. Plant hormone
- D. Nutrient element

55. The first step in disease development is:

- A. Sporulation
- B. Infection
- C. Penetration
- D. Inoculation

56. Entry of pathogen into host tissue is:

- A. Penetration
- B. Dissemination
- C. Sporulation
- D. Colonization

57. Pathogens entering through stomata are using:

- A. Natural openings
- B. Wounds
- C. Direct penetration
- D. Vectors

58. The visible expression of disease is called:

- A. Sign
- B. Symptom
- C. Infection
- D. Inoculum

59. Wilt disease primarily affects:

- A. Water transport system
- B. Photosynthesis only
- C. Seed germination
- D. Flowering only

60. Chlorosis refers to:

- A. Tissue death
- B. Yellowing of leaves
- C. Leaf curling
- D. Root rot

61. Necrosis means:

- A. Yellowing
- B. Tissue death
- C. Overgrowth
- D. Wilting

62. Hypertrophy is:

- A. Reduction in cell size
- B. Increase in cell size
- C. Tissue death
- D. Leaf drop

63. Plant viruses are commonly transmitted by:

- A. Insects
- B. Earthworms
- C. Nematodes only
- D. Fungi only

64. Tobacco mosaic disease is caused by:

- A. Fungus
- B. Bacterium
- C. Virus
- D. Nematode

65. Citrus canker is caused by:

- A. Fungus
- B. Virus
- C. Bacterium
- D. Nematode

66. Crown gall disease is caused by:

- A. *Agrobacterium tumefaciens*
- B. *Pseudomonas syringae*
- C. *Xanthomonas campestris*
- D. *Erwinia amylovora*

67. Root-knot disease is caused by:

- A. Virus
- B. Fungus
- C. Nematode
- D. Bacterium

68. Meloidogyne species are:

- A. Fungi
- B. Bacteria
- C. Viruses
- D. Nematodes

69. Late blight of potato was responsible for:

- A. Bengal famine
- B. Irish potato famine
- C. Great plague
- D. Dust bowl

70. Alternate host of *Puccinia graminis* is:

- A. Mustard
- B. Barberry
- C. Cotton
- D. Rice

71. A disease affecting seedlings before emergence is:

- A. Wilt
- B. Damping-off
- C. Rust
- D. Smut

72. Damping-off is commonly caused by:

- A. *Pythium*
- B. TMV

- C. Xanthomonas
- D. Meloidogyne

73. An obligate parasite can:

- A. Grow on artificial media easily
- B. Grow only on living hosts
- C. Live independently in soil
- D. Fix nitrogen

74. Rust fungi are generally:

- A. Saprophytes
- B. Facultative parasites
- C. Obligate parasites
- D. Predators

75. Epidemic development of plant disease is called:

- A. Etiology
- B. Epidemiology
- C. Pathogenesis
- D. Taxonomy

76. Integrated Disease Management (IDM) combines:

- A. Only fungicides
- B. Only resistant varieties
- C. Multiple compatible methods
- D. Only biological control

77. Crop rotation is mainly used to:

- A. Increase pathogen population
- B. Break disease cycles
- C. Increase weeds
- D. Reduce fertilizers

78. Use of disease-resistant cultivars is:

- A. Genetic control
- B. Chemical control
- C. Mechanical control
- D. Physical control

79. Bordeaux mixture is a:

- A. Insecticide
- B. Herbicide
- C. Fungicide
- D. Nematicide

80. Bordeaux mixture contains copper sulfate and:

- A. Sulfur
- B. Lime
- C. Potassium nitrate
- D. Urea

81. Seed treatment primarily aims to:

- A. Improve flavor
- B. Eliminate seed-borne pathogens

- C. Increase weeds
- D. Reduce germination

82. Biological control utilizes:

- A. Pathogens only
- B. Natural antagonists
- C. Herbicides
- D. Radiation

83. Trichoderma species are widely used as:

- A. Plant viruses
- B. Bio-control fungi
- C. Insect pests
- D. Nematodes

84. Hyperparasitism means:

- A. Parasite attacking another parasite
- B. Plant attacking fungus
- C. Virus attacking plant
- D. Fungus attacking insect

85. Quarantine regulations are designed to:

- A. Spread diseases
- B. Prevent pathogen introduction
- C. Increase imports
- D. Increase pesticide use

86. Eradication involves:

- A. Eliminating inoculum sources
- B. Increasing pathogen growth
- C. Reducing fertilizer use
- D. Irrigation management only

87. Fungicides that move within plant tissues are:

- A. Contact fungicides
- B. Systemic fungicides
- C. Dust fungicides
- D. Botanical fungicides

88. Mancozeb is a:

- A. Contact fungicide
- B. Antibiotic
- C. Nematicide
- D. Growth regulator

89. Carbendazim is:

- A. Herbicide
- B. Systemic fungicide
- C. Insecticide
- D. Bactericide

90. Sanitation in plant disease management includes:

- A. Removal of infected debris
- B. Increasing inoculum
- C. Waterlogging
- D. Monocropping

91. Forecasting of plant diseases helps:

- A. Reduce management costs
- B. Time control measures effectively
- C. Increase epidemics
- D. Increase pathogen virulence

92. Plant disease forecasting is based on:

- A. Weather data
- B. Pathogen biology
- C. Host susceptibility
- D. All of these

93. PCR is commonly used for:

- A. Disease diagnosis
- B. Irrigation management
- C. Seed storage
- D. Fertilizer application

94. ELISA is widely used for detection of:

- A. Viruses
- B. Weeds
- C. Insects
- D. Algae

95. Mycorrhizae enhance:

- A. Disease severity only
- B. Nutrient uptake
- C. Weed growth
- D. Pathogen virulence

96. The most environmentally friendly disease management strategy is:

- A. Excessive fungicide use
- B. Biological control
- C. Burning all crops
- D. Monoculture

97. Host resistance is considered:

- A. Preventive disease management
- B. Curative treatment only
- C. Post-harvest treatment only
- D. Mechanical control only

98. Gene-for-gene theory was proposed by:

- A. Flor
- B. Koch
- C. Pasteur
- D. De Bary

99. Induced systemic resistance (ISR) is commonly associated with:

- A. Beneficial rhizobacteria
- B. Viruses
- C. Nematodes
- D. Weeds

100. The ultimate goal of plant disease management is:

- A. Complete eradication of all microorganisms
- B. Economical reduction of disease losses
- C. Elimination of all fungi
- D. Maximum pesticide use

ANSWER KEYS

1	C	21	C	41	A	61	B	81	B
2	B	22	B	42	B	62	B	82	B
3	C	23	B	43	B	63	A	83	B
4	B	24	C	44	A	64	C	84	A
5	B	25	C	45	A	65	C	85	B
6	B	26	C	46	B	66	A	86	A
7	B	27	B	47	C	67	C	87	B
8	B	28	C	48	B	68	D	88	A
9	C	29	D	49	A	69	B	89	B
10	C	30	C	50	B	70	B	90	A
11	C	31	B	51	B	71	B	91	B
12	C	32	C	52	C	72	A	92	D
13	A	33	C	53	A	73	B	93	A
14	C	34	B	54	B	74	C	94	A
15	B	35	C	55	D	75	B	95	B
16	C	36	B	56	A	76	C	96	B
17	D	37	C	57	A	77	B	97	A
18	B	38	B	58	B	78	A	98	A
19	C	39	C	59	A	79	C	99	A
20	B	40	B	60	B	80	B	100	B

Biostatistics

1. Biostatistics is the application of statistics to:

- A. Physics
- B. Biological sciences
- C. Chemistry
- D. Engineering

2. Statistics is primarily concerned with:

- A. Plant classification
- B. Collection, analysis, and interpretation of data
- C. Plant physiology
- D. Taxonomy

3. Which of the following is qualitative data?

- A. Plant height
- B. Seed weight
- C. Flower color
- D. Leaf area

4. Which is an example of quantitative data?

- A. Disease symptoms
- B. Flower color
- C. Plant height
- D. Leaf shape

5. The average of observations is called:

- A. Median
- B. Mode
- C. Mean
- D. Range

6. The middle value of an arranged dataset is:

- A. Mean
- B. Median
- C. Mode
- D. Variance

7. The most frequently occurring observation is:

- A. Mean
- B. Median
- C. Mode
- D. Standard deviation

8. Which measure describes the spread of data?

- A. Mean
- B. Median
- C. Variance
- D. Frequency

9. Standard deviation measures:

- A. Central tendency
- B. Dispersion
- C. Correlation
- D. Regression

10. A population is:

- A. Small sample
- B. Entire group under study
- C. Experimental unit
- D. Observation

11. A subset of a population is called:

- A. Variable
- B. Sample
- C. Treatment
- D. Block

12. Experimental units in a wheat trial may be:

- A. Farmers
- B. Plants or plots
- C. Fertilizers
- D. Diseases

13. Random sampling helps to:

- A. Increase bias
- B. Reduce bias
- C. Increase errors
- D. Eliminate data

14. Which is a measure of central tendency?

- A. Mean
- B. Variance
- C. Range
- D. Standard deviation

15. Which graph is best for frequency distribution?

- A. Pie chart
- B. Histogram
- C. Flowchart
- D. Line diagram

16. Bar charts are mainly used for:

- A. Continuous data
- B. Categorical data
- C. Regression
- D. Correlation

17. Scatter diagrams are used to study:

- A. Frequency
- B. Correlation
- C. Mean
- D. Variance

18. Correlation coefficient (r) ranges from:

- A. 0 to 100
- B. -1 to +1
- C. -10 to +10
- D. 1 to 10

19. A perfect positive correlation is:

- A. 0
- B. -1
- C. +1
- D. 0.5

20. Regression analysis is used to:

- A. Compare means
- B. Predict one variable from another
- C. Count frequencies
- D. Arrange data

21. Which test compares the means of two groups?

- A. Chi-square test
- B. t-test
- C. ANOVA
- D. Correlation

22. ANOVA stands for:

- A. Analysis of Variables
- B. Analysis of Variance
- C. Average Number of Values
- D. Annual Variance

23. ANOVA is mainly used to compare:

- A. Two means only
- B. Three or more means
- C. Percentages
- D. Frequencies

24. The null hypothesis states:

- A. There is a significant difference
- B. There is no significant difference
- C. Variables are correlated
- D. Data are skewed

25. The alternative hypothesis indicates:

- A. No effect
- B. Significant effect
- C. Equal means
- D. Equal variances

26. The significance level commonly used is:

- A. 0.50
- B. 0.10
- C. 0.05
- D. 0.80

27. A p-value less than 0.05 indicates:

- A. Accept null hypothesis
- B. Reject null hypothesis
- C. Ignore data
- D. Repeat experiment

28. Replication in experiments helps to:

- A. Increase experimental error
- B. Improve precision
- C. Reduce sample size
- D. Eliminate treatments

29. Randomization is used to:

- A. Prevent bias
- B. Increase variability
- C. Reduce sample size
- D. Increase treatments

30. Blocking is used to:

- A. Increase error
- B. Reduce environmental variation
- C. Increase treatments
- D. Reduce replication

31. Completely Randomized Design (CRD) is suitable when:

- A. Experimental units are homogeneous
- B. Soil is highly variable
- C. Field has gradients
- D. Only two treatments exist

32. Randomized Complete Block Design (RCBD) is preferred when:

- A. Experimental area is heterogeneous
- B. No variation exists
- C. One treatment only
- D. No replication

33. Latin Square Design controls:

- A. One source of variation
- B. Two sources of variation
- C. Three sources
- D. Four sources

34. Which software is commonly used for statistical analysis?

- A. MS Paint
- B. SPSS
- C. VLC
- D. Photoshop

35. Which software is freely available for statistical analysis?

- A. R
- B. MS Word
- C. Excel only
- D. AutoCAD

36. Excel can be used for:

- A. Data entry and basic statistics
- B. DNA sequencing
- C. Taxonomy
- D. Plant breeding only

37. Which measure is most affected by outliers?

- A. Median
- B. Mode
- C. Mean
- D. Quartiles

38. Range is calculated as:

- A. Maximum – Minimum
- B. Mean $\times$ Median
- C. Variance $\div$ Mean
- D. Sum $\div$ Frequency

39. Which measure is least affected by extreme values?

- A. Mean
- B. Median
- C. Variance
- D. Standard deviation

40. Degrees of freedom are important in:

- A. Statistical tests
- B. Taxonomy
- C. Ecology only
- D. Genetics only

41. The coefficient of variation (CV) is used to compare:

- A. Means
- B. Relative variability
- C. Sample size
- D. Treatments

42. Which experiment generally requires replication?

- A. Field experiment
- B. Laboratory experiment
- C. Greenhouse experiment
- D. All of these

43. Which test is commonly used for categorical data?

- A. t-test
- B. ANOVA
- C. Chi-square test
- D. Regression

44. The dependent variable in a fertilizer experiment is usually:

- A. Fertilizer level
- B. Plant growth or yield
- C. Plot number
- D. Replication

45. The independent variable in a fertilizer trial is:

- A. Plant height
- B. Fertilizer treatment
- C. Yield
- D. Disease incidence

46. Which sampling method gives every unit an equal chance of selection?

- A. Purposive sampling
- B. Random sampling
- C. Convenience sampling
- D. Judgment sampling

47. In plant pathology, disease incidence is usually expressed as:

- A. Percentage
- B. Kilograms
- C. Liters
- D. Meters

48. Disease severity is commonly measured using:

- A. Rating scales
- B. Molecular markers
- C. DNA sequencing
- D. Fertilizer analysis

49. Which statistical method is most suitable for studying the relationship between rainfall and disease incidence?

- A. Correlation analysis
- B. Chi-square test
- C. Median test
- D. Frequency table

50. The primary purpose of biostatistics in plant sciences is to:

- A. Increase experimental errors
- B. Draw reliable scientific conclusions from biological data
- C. Replace laboratory experiments
- D. Eliminate variability

51. Which measure of dispersion is expressed in the same units as the original data?

- A. Variance
- B. Standard deviation
- C. Coefficient of variation
- D. Correlation coefficient

52. Variance is equal to:

- A. Standard deviation
- B. Square of the standard deviation
- C. Mean $\times$ Standard deviation
- D. Range²

53. Which measure is unitless?

- A. Mean
- B. Variance
- C. Coefficient of variation
- D. Standard deviation

54. The coefficient of variation (CV) is calculated as:

- A. $(\text{Variance} \times 100)/\text{Mean}$
- B. $(\text{Standard deviation} \times 100)/\text{Mean}$
- C. $\text{Mean}/\text{Standard deviation}$
- D. $\text{Mean} \times \text{Standard deviation}$

55. A low coefficient of variation indicates:

- A. High variability
- B. Greater precision
- C. Poor experiment
- D. Large sampling error

56. Which sampling method divides the population into homogeneous groups?

- A. Random sampling
- B. Stratified sampling
- C. Cluster sampling
- D. Systematic sampling

57. In systematic sampling, samples are selected:

- A. Randomly only
- B. At regular intervals
- C. By researcher preference
- D. By lottery only

58. Which sampling method is generally preferred for field surveys?

- A. Stratified random sampling
- B. Judgment sampling
- C. Purposive sampling
- D. Convenience sampling

59. Sampling error decreases when:

- A. Sample size decreases
- B. Sample size increases
- C. Population increases
- D. Variability increases

60. Which distribution is most common in biological data?

- A. Uniform distribution
- B. Normal distribution
- C. Rectangular distribution
- D. Poisson only

61. A normal distribution is:

- A. Asymmetrical
- B. Bell-shaped
- C. Triangular
- D. Rectangular

62. In a normal distribution, the mean, median, and mode are:

- A. Different
- B. Equal
- C. Zero
- D. Negative

63. Approximately 95% of observations lie within:

- A. ± 1 SD
- B. ± 2 SD
- C. ± 3 SD
- D. ± 4 SD

64. Which distribution is commonly used for count data?

- A. Normal
- B. Poisson
- C. Uniform
- D. Exponential

65. Which statistical test is appropriate for comparing frequencies?

- A. t-test
- B. ANOVA
- C. Chi-square test
- D. Regression

66. The chi-square test is mainly applied to:

- A. Continuous variables
- B. Categorical variables
- C. Correlation coefficients
- D. Means

67. Which of the following is a parametric test?

- A. Mann-Whitney test
- B. Chi-square test
- C. t-test
- D. Kruskal-Wallis test

68. Non-parametric tests are preferred when:

- A. Data are normally distributed
- B. Data violate assumptions of normality
- C. Sample size is very large only
- D. Variance is zero

69. The probability of committing a Type I error is represented by:

- A. β
- B. α
- C. r
- D. R^2

70. A Type I error occurs when:

- A. A true null hypothesis is rejected
- B. A false null hypothesis is accepted

- C. Data are normally distributed
- D. Sample size is large

71. Type II error occurs when:

- A. Rejecting a true null hypothesis
- B. Accepting a false null hypothesis
- C. Mean equals median
- D. Variance is zero

72. Statistical power increases with:

- A. Smaller sample size
- B. Larger sample size
- C. Larger experimental error
- D. Smaller replication

73. Which of the following increases experimental precision?

- A. Randomization
- B. Replication
- C. Blocking
- D. All of these

74. Which experimental design is simplest?

- A. RCBD
- B. Latin Square Design
- C. CRD
- D. Split Plot Design

75. Split-plot design is mainly used when:

- A. All treatments are equally easy to apply
- B. One factor is difficult to apply
- C. There is only one treatment
- D. No replication is required

76. In a factorial experiment:

- A. Only one factor is studied
- B. Two or more factors are studied simultaneously
- C. No replication is used
- D. No interaction is estimated

77. Interaction in factorial experiments means:

- A. Independent effect of factors
- B. Combined effect of factors
- C. Sampling error
- D. Random error

78. Residual error in ANOVA is also called:

- A. Experimental error
- B. Treatment effect
- C. Block effect
- D. Regression error

79. The F-test is used in:

- A. Correlation
- B. ANOVA

- C. Regression only
- D. Chi-square

80. If calculated F is greater than table F:

- A. Accept H_0
- B. Reject H_0
- C. Repeat experiment
- D. Ignore results

81. LSD stands for:

- A. Least Significant Difference
- B. Large Standard Deviation
- C. Least Sample Difference
- D. Lowest Statistical Data

82. LSD is used:

- A. Before ANOVA
- B. After significant ANOVA
- C. Before sampling
- D. During randomization

83. Duncan's Multiple Range Test (DMRT) is used for:

- A. Correlation
- B. Mean comparison
- C. Regression
- D. Sampling

84. Tukey's HSD test is used:

- A. For comparing treatment means
- B. To estimate variance
- C. To calculate correlation
- D. To determine sample size

85. Pearson correlation is suitable for:

- A. Quantitative variables
- B. Nominal variables
- C. Ordinal variables only
- D. Qualitative variables only

86. Spearman correlation is mainly used for:

- A. Ranked data
- B. Continuous data only
- C. Categorical data
- D. Frequency data

87. A negative correlation means:

- A. Both variables increase
- B. One variable increases while the other decreases
- C. No relationship exists
- D. Variables are equal

88. The coefficient of determination is represented by:

- A. r
- B. r^2

- C. CV
- D. SD

89. An r^2 value of 0.81 means:

- A. 81% variation is explained
- B. Correlation is negative
- C. No relationship exists
- D. Standard deviation is 81

90. The dependent variable is also known as the:

- A. Predictor variable
- B. Response variable
- C. Independent variable
- D. Blocking factor

91. Which graph is best for showing changes over time?

- A. Histogram
- B. Pie chart
- C. Line graph
- D. Box plot

92. A box plot is useful for displaying:

- A. DNA sequences
- B. Distribution and outliers
- C. Frequencies only
- D. Regression equations

93. Outliers are observations that:

- A. Lie close to the mean
- B. Differ markedly from other observations
- C. Equal the median
- D. Have zero variance

94. Which measure is resistant to outliers?

- A. Mean
- B. Standard deviation
- C. Median
- D. Variance

95. The standard error of the mean (SEM) measures:

- A. Variation among observations
- B. Precision of the sample mean
- C. Population variance
- D. Experimental design

96. Confidence intervals are used to:

- A. Estimate the range containing the true population parameter
- B. Calculate variance only
- C. Measure disease severity
- D. Replace hypothesis testing

97. In plant breeding experiments, heritability estimates are based on:

- A. Statistical variance components
- B. Soil pH
- C. Fertilizer dose only
- D. Rainfall alone

98. Which statistical technique is commonly used to summarize many correlated plant traits?

- A. Principal Component Analysis (PCA)
- B. t-test
- C. Chi-square test
- D. Histogram

99. Cluster analysis is mainly used to:

- A. Compare two means
- B. Group similar observations
- C. Calculate p-values
- D. Estimate variance

100. The most important objective of statistical analysis in plant science research is to:

- A. Produce more tables
- B. Draw valid and scientifically reliable conclusions
- C. Increase sample size
- D. Eliminate biological variation

ANSWER KEYS

1	B	21	B	41	B	61	B	81	A
2	B	22	B	42	D	62	B	82	B
3	C	23	B	43	C	63	B	83	B
4	C	24	B	44	B	64	B	84	A
5	C	25	B	45	B	65	C	85	A
6	B	26	C	46	B	66	B	86	A
7	C	27	B	47	A	67	C	87	B
8	C	28	B	48	A	68	B	88	B
9	B	29	A	49	A	69	B	89	A
10	B	30	B	50	B	70	A	90	B
11	B	31	A	51	B	71	B	91	C
12	B	32	A	52	B	72	B	92	B
13	B	33	B	53	C	73	D	93	B
14	A	34	B	54	B	74	C	94	C
15	B	35	A	55	B	75	B	95	B
16	B	36	A	56	B	76	B	96	A
17	B	37	C	57	B	77	B	97	A
18	B	38	A	58	A	78	A	98	A
19	C	39	B	59	B	79	B	99	B
20	B	40	A	60	B	80	B	100	B

Bacteriology & Virology

1. Bacteriology is the branch of science that deals with the study of:

- A. Viruses
- B. Bacteria
- C. Fungi
- D. Algae

2. The scientist known as the "Father of Bacteriology" is:

- A. Louis Pasteur
- B. Robert Koch
- C. Anton de Bary
- D. Edward Jenner

3. The first person to observe bacteria under a microscope was:

- A. Robert Hooke
- B. Antonie van Leeuwenhoek
- C. Louis Pasteur
- D. Robert Koch

4. Bacteria are:

- A. Eukaryotic organisms
- B. Prokaryotic organisms
- C. Multicellular organisms
- D. Acellular organisms

5. Which structure is absent in bacterial cells?

- A. Cell membrane
- B. Ribosomes
- C. Nucleus
- D. Cytoplasm

6. The genetic material of bacteria is present in the:

- A. Nucleus
- B. Nucleoid
- C. Vacuole
- D. Mitochondria

7. Most bacterial cell walls are composed of:

- A. Chitin
- B. Cellulose
- C. Peptidoglycan
- D. Lignin

8. The shape of spherical bacteria is called:

- A. Bacillus
- B. Spirillum
- C. Coccus
- D. Vibrio

9. Rod-shaped bacteria are known as:

- A. Cocci
- B. Bacilli
- C. Vibrios
- D. Spirochetes

10. Comma-shaped bacteria are called:

- A. Spirilla
- B. Vibrios
- C. Bacilli
- D. Cocci

11. Spiral-shaped bacteria are called:

- A. Bacilli
- B. Cocci
- C. Spirilla
- D. Diplococci

12. Which bacterial structure is mainly responsible for motility?

- A. Capsule
- B. Pili
- C. Flagella
- D. Cell wall

13. Short hair-like appendages used for attachment are:

- A. Flagella
- B. Pili (Fimbriae)
- C. Capsules
- D. Spores

14. The protective outer covering in many bacteria is:

- A. Capsule
- B. Cell membrane
- C. Ribosome
- D. Nucleoid

15. Which bacterial structure enables survival under unfavorable conditions?

- A. Capsule
- B. Endospore
- C. Pili
- D. Flagella

16. Endospores are commonly produced by:

- A. *Rhizobium*
- B. *Bacillus*
- C. *Agrobacterium*
- D. *Xanthomonas*

17. The bacterial plasma membrane is primarily composed of:

- A. Cellulose
- B. Phospholipids and proteins
- C. Chitin
- D. Peptidoglycan

18. Gram-positive bacteria retain:

- A. Red stain
- B. Green stain
- C. Crystal violet stain
- D. Yellow stain

19. Gram-negative bacteria appear:

- A. Purple
- B. Blue
- C. Pink or red
- D. Green

20. The Gram stain was developed by:

- A. Robert Koch
- B. Hans Christian Gram
- C. Louis Pasteur
- D. Leeuwenhoek

21. Which ribosomes are found in bacteria?

- A. 80S
- B. 70S
- C. 60S
- D. 50S

22. Bacteria usually reproduce by:

- A. Budding
- B. Binary fission
- C. Mitosis
- D. Meiosis

23. Which phase of the bacterial growth curve is characterized by rapid cell division?

- A. Lag phase
- B. Log (Exponential) phase
- C. Stationary phase
- D. Death phase

24. During the stationary phase:

- A. Cell division stops completely
- B. Cell division equals cell death
- C. Cells grow rapidly
- D. Spores germinate

25. Which of the following is the most suitable temperature range for the growth of many plant pathogenic bacteria?

- A. 0–5°C
- B. 20–30°C
- C. 50–60°C
- D. 80–100°C

26. Plant bacteriology is the study of:

- A. Animal pathogenic bacteria
- B. Human pathogenic bacteria
- C. Plant pathogenic bacteria
- D. Marine bacteria

27. Which of the following is a plant pathogenic bacterium?

- A. *Bacillus subtilis*
- B. *Rhizobium leguminosarum*
- C. *Xanthomonas campestris*
- D. *Lactobacillus acidophilus*

28. Crown gall disease is caused by:

- A. *Pseudomonas syringae*
- B. *Agrobacterium tumefaciens*
- C. *Ralstonia solanacearum*
- D. *Erwinia amylovora*

29. The bacterium responsible for bacterial wilt of tomato is:

- A. *Xanthomonas campestris*
- B. *Ralstonia solanacearum*
- C. *Pectobacterium carotovorum*
- D. *Agrobacterium tumefaciens*

30. Citrus canker is caused by:

- A. *Pseudomonas syringae*
- B. *Xanthomonas citri*
- C. *Agrobacterium tumefaciens*
- D. *Clavibacter michiganensis*

31. Fire blight of apple and pear is caused by:

- A. *Ralstonia solanacearum*
- B. *Erwinia amylovora*
- C. *Xanthomonas campestris*
- D. *Pseudomonas fluorescens*

32. Soft rot of potato is commonly caused by:

- A. *Pectobacterium carotovorum*
- B. *Agrobacterium tumefaciens*
- C. *Rhizobium spp.*
- D. *Bacillus subtilis*

33. Black rot of crucifers is caused by:

- A. *Xanthomonas campestris* pv. *campestris*
- B. *Pseudomonas syringae*
- C. *Ralstonia solanacearum*
- D. *Erwinia amylovora*

34. Angular leaf spot of cotton is caused by:

- A. *Xanthomonas citri*
- B. *Xanthomonas citri* pv. *malvacearum*
- C. *Pectobacterium carotovorum*
- D. *Clavibacter michiganensis*

35. Agrobacterium tumefaciens transfers which DNA into plant cells?

- A. rDNA
- B. Ti plasmid DNA (T-DNA)
- C. Mitochondrial DNA
- D. Chloroplast DNA

36. The Ti plasmid is associated with:

- A. Virus replication
- B. Crown gall formation
- C. Nitrogen fixation
- D. Photosynthesis

37. Which bacterium is widely used as a genetic engineering tool in plants?

- A. *Bacillus subtilis*
- B. *Agrobacterium tumefaciens*
- C. *Escherichia coli*
- D. *Rhizobium leguminosarum*

38. Plant pathogenic bacteria usually enter plants through:

- A. Roots only
- B. Stomata, hydathodes, and wounds
- C. Flowers only
- D. Seeds only

39. Water-soaked lesions are typical symptoms of:

- A. Viral diseases
- B. Bacterial diseases
- C. Nematode diseases
- D. Nutrient deficiency

40. Bacterial ooze is commonly observed in:

- A. Bacterial wilt
- B. Rust disease
- C. Powdery mildew
- D. Smut disease

41. Which of the following is Gram-negative?

- A. *Agrobacterium tumefaciens*
- B. *Bacillus subtilis*
- C. *Clostridium botulinum*
- D. *Streptomyces* spp.

42. Which bacterial disease affects rice?

- A. Bacterial leaf blight
- B. Powdery mildew
- C. Rust
- D. Loose smut

43. Bacterial leaf blight of rice is caused by:

- A. *Xanthomonas oryzae* pv. *oryzae*
- B. *Ralstonia solanacearum*

- C. *Erwinia amylovora*
- D. *Agrobacterium tumefaciens*

44. Which of the following is NOT a bacterial disease?

- A. Citrus canker
- B. Fire blight
- C. Tobacco mosaic
- D. Bacterial wilt

45. The best method for preventing bacterial diseases is:

- A. Resistant varieties
- B. Excessive irrigation
- C. High nitrogen fertilization
- D. Deep shading

46. Copper compounds are commonly used to manage:

- A. Viral diseases
- B. Bacterial diseases
- C. Nematode diseases
- D. Physiological disorders

47. Crop sanitation includes:

- A. Removing infected plant debris
- B. Increasing plant density
- C. Waterlogging fields
- D. Delaying harvesting

48. Plant pathogenic bacteria are primarily spread by:

- A. Wind, rain splash, insects, and contaminated tools
- B. Earthquakes
- C. Sunlight
- D. Fertilizers

49. Which diagnostic test is commonly used to identify bacterial pathogens?

- A. Gram staining
- B. ELISA only
- C. Southern blotting
- D. Chromatography

50. PCR is widely used in plant bacteriology for:

- A. Disease diagnosis
- B. Seed storage
- C. Fertilizer analysis
- D. Irrigation scheduling

51. Virology is the study of:

- A. Bacteria
- B. Fungi
- C. Viruses
- D. Algae

52. The Father of Virology is:

- A. Robert Koch
- B. Louis Pasteur
- C. Dmitri Ivanovsky
- D. Anton de Bary

53. Who demonstrated that the tobacco mosaic disease was caused by a filterable agent?

- A. Robert Koch
- B. Dmitri Ivanovsky
- C. Louis Pasteur
- D. Alexander Fleming

54. Which scientist coined the term "virus" for the infectious agent causing tobacco mosaic disease?

- A. Martinus Beijerinck
- B. Robert Koch
- C. Edward Jenner
- D. Louis Pasteur

55. Viruses are:

- A. Prokaryotic organisms
- B. Eukaryotic organisms
- C. Acellular infectious agents
- D. Multicellular organisms

56. A complete virus particle is called:

- A. Capsid
- B. Virion
- C. Viroid
- D. Nucleocapsid

57. The protein coat of a virus is called:

- A. Envelope
- B. Capsid
- C. Membrane
- D. Cell wall

58. The protein subunits that make up the capsid are called:

- A. Ribosomes
- B. Capsomeres
- C. Pili
- D. Plasmids

59. Viruses contain:

- A. DNA only
- B. RNA only
- C. Either DNA or RNA
- D. Both DNA and RNA simultaneously

60. Which of the following is NOT found in viruses?

- A. Genetic material
- B. Protein coat

- C. Ribosomes
- D. Capsid

61. Viral multiplication occurs only:

- A. In soil
- B. Inside living host cells
- C. In distilled water
- D. On artificial media

62. Viruses are classified as:

- A. Obligate parasites
- B. Facultative parasites
- C. Saprophytes
- D. Symbionts

63. The virus responsible for Tobacco Mosaic Disease is:

- A. Potato virus X
- B. Tobacco mosaic virus (TMV)
- C. Cucumber mosaic virus
- D. Tomato spotted wilt virus

64. Tobacco mosaic virus has which type of genome?

- A. Double-stranded DNA
- B. Single-stranded RNA
- C. Double-stranded RNA
- D. Single-stranded DNA

65. The shape of Tobacco mosaic virus is:

- A. Icosahedral
- B. Rod-shaped
- C. Spherical
- D. Bullet-shaped

66. Viruses reproduce by:

- A. Binary fission
- B. Budding
- C. Replication within host cells
- D. Mitosis

67. Which enzyme converts viral RNA into DNA in retroviruses?

- A. DNA polymerase
- B. RNA polymerase
- C. Reverse transcriptase
- D. Ligase

68. Viral diseases are commonly diagnosed using:

- A. ELISA
- B. PCR
- C. Electron microscopy
- D. All of these

69. ELISA stands for:

- A. Enzyme-Linked Immunosorbent Assay
- B. Enzyme-Labeled Immune Sample Analysis

- C. Electron Linked Immunological Study
- D. Enzyme Light Immunological Assay

70. PCR is mainly used for:

- A. Virus detection
- B. Fertilizer analysis
- C. Soil texture analysis
- D. Seed germination

71. The International Committee responsible for virus classification is:

- A. FAO
- B. ICTV
- C. WHO
- D. ICAR

72. A viroid is:

- A. A bacterium
- B. A naked infectious RNA molecule
- C. A fungal spore
- D. A bacterial plasmid

73. Which of the following diseases is caused by a viroid?

- A. Potato spindle tuber disease
- B. Citrus canker
- C. Wheat rust
- D. Crown gall

74. Prions are infectious agents composed of:

- A. DNA
- B. RNA
- C. Protein only
- D. Lipids

75. Which statement about viruses is correct?

- A. They contain chlorophyll.
- B. They can grow on nutrient agar without a host.
- C. They are obligate intracellular parasites.
- D. They possess both DNA and RNA.

76. Tobacco mosaic virus (TMV) primarily infects:

- A. Rice
- B. Tobacco
- C. Wheat
- D. Maize

77. The characteristic symptom of Tobacco Mosaic Virus is:

- A. Root galls
- B. Mosaic mottling of leaves
- C. Stem canker
- D. Soft rot

78. Cucumber mosaic virus (CMV) belongs to the genus:

- A. Tobamovirus
- B. Cucumovirus
- C. Potyvirus
- D. Begomovirus

79. Potato virus X (PVX) belongs to the genus:

- A. Potyvirus
- B. Potexvirus
- C. Tobamovirus
- D. Begomovirus

80. Potato virus Y (PVY) belongs to the genus:

- A. Tobamovirus
- B. Potexvirus
- C. Potyvirus
- D. Cucumovirus

81. Tomato leaf curl disease is mainly caused by:

- A. TMV
- B. Tomato leaf curl virus (ToLCV)
- C. PVX
- D. CMV

82. Tomato leaf curl virus is primarily transmitted by:

- A. Aphids
- B. Whiteflies (*Bemisia tabaci*)
- C. Thrips
- D. Leafhoppers

83. Rice tungro disease is caused by:

- A. One virus only
- B. A virus and a fungus
- C. Two different viruses acting together
- D. A bacterium

84. Rice tungro virus is transmitted by:

- A. Aphids
- B. Leafhoppers
- C. Whiteflies
- D. Nematodes

85. Banana bunchy top disease is caused by:

- A. Banana bunchy top virus (BBTV)
- B. Banana mosaic virus
- C. CMV
- D. PVY

86. Citrus tristeza disease is caused by:

- A. Citrus tristeza virus (CTV)
- B. TMV
- C. CMV
- D. PVX

87. The most common insect vectors of plant viruses are:

- A. Aphids
- B. Whiteflies
- C. Leafhoppers
- D. All of these

88. Aphids transmit many plant viruses in a:

- A. Persistent manner only
- B. Non-persistent manner
- C. Soil-borne manner only
- D. Water-borne manner

89. Plant viruses can also be transmitted through:

- A. Seed
- B. Pollen
- C. Vegetative propagation
- D. All of these

90. Which symptom is commonly associated with viral diseases of plants?

- A. Mosaic
- B. Chlorosis
- C. Leaf curling
- D. All of these

91. Ring spot symptoms are commonly associated with:

- A. Viral diseases
- B. Bacterial diseases
- C. Fungal diseases
- D. Nematode infections

92. The most effective strategy for managing viral diseases is:

- A. Application of antibiotics
- B. Growing resistant varieties
- C. Applying fungicides
- D. Excessive nitrogen fertilizer

93. Which practice helps reduce virus transmission by insect vectors?

- A. Vector control
- B. Excessive irrigation
- C. Deep ploughing only
- D. Increasing plant density

94. ELISA is widely used for:

- A. Detection of plant viruses
- B. Measuring soil pH
- C. Seed germination testing
- D. Fertilizer analysis

95. RT-PCR is particularly useful for detecting:

- A. RNA viruses
- B. DNA viruses only
- C. Fungi
- D. Bacteria

96. Cross protection refers to:

- A. Protecting plants with fungicides
- B. Infection by a mild virus strain to protect against a severe strain
- C. Crop rotation
- D. Seed treatment

97. Virus-free planting material is produced mainly through:

- A. Meristem culture
- B. Layering
- C. Air layering
- D. Grafting

98. Which modern molecular technique is increasingly used for discovering new plant viruses?

- A. Next-Generation Sequencing (NGS)
- B. Gram staining
- C. Light microscopy
- D. Colony counting

99. Integrated management of plant viral diseases includes:

- A. Resistant varieties
- B. Vector control
- C. Virus-free planting material
- D. All of these

100. The primary objective of plant virus management is to:

- A. Eliminate all microorganisms from the field
- B. Reduce virus spread and economic crop losses
- C. Increase insect populations
- D. Promote disease development

Answer Key

1	B	21	B	41	A	61	B	81	B
2	B	22	B	42	A	62	A	82	B
3	B	23	B	43	A	63	B	83	C
4	B	24	B	44	C	64	B	84	B
5	C	25	B	45	A	65	B	85	A
6	B	26	C	46	B	66	C	86	A
7	C	27	C	47	A	67	C	87	D
8	C	28	B	48	A	68	D	88	B
9	B	29	B	49	A	69	A	89	D
10	B	30	B	50	A	70	A	90	D
11	C	31	B	51	C	71	B	91	A
12	C	32	A	52	C	72	B	92	B
13	B	33	A	53	B	73	A	93	A
14	A	34	B	54	A	74	C	94	A
15	B	35	B	55	C	75	C	95	A
16	B	36	B	56	B	76	B	96	B
17	B	37	B	57	B	77	B	97	A
18	C	38	B	58	B	78	B	98	A
19	C	39	B	59	C	79	B	99	D
20	B	40	A	60	C	80	C	100	B

Molecular Biology & Genetics

1. Which of the following is a storage polysaccharide in plants?

- a) Chitin
- b) Glycogen
- c) Starch
- d) Cellulose

2. The monomeric unit of nucleic acids is:

- a) Amino acid
- b) Nucleotide
- c) Monosaccharide
- d) Fatty acid

3. Phospholipids are major components of:

- a) Cell wall
- b) Nuclear matrix
- c) Cell membrane
- d) Ribosome

4. The cell theory was proposed by:

- a) Watson and Crick
- b) Schleiden and Schwann
- c) Mendel and Morgan
- d) Darwin and Wallace

5. Prokaryotic cells lack:

- a) Ribosomes

b) Plasma membrane

c) Membrane-bound nucleus

d) DNA

6. The cell wall of bacteria is primarily composed of:

- a) Cellulose
- b) Chitin
- c) Peptidoglycan
- d) Pectin

7. The fluid mosaic model describes the structure of:

- a) Nucleus
- b) Cell wall
- c) Cell membrane
- d) Cytoplasm

8. The nucleolus is involved in:

- a) Lipid synthesis
- b) Ribosomal RNA synthesis
- c) ATP production
- d) Protein packaging

9. Rough endoplasmic reticulum is studded with:

- a) Lysosomes
- b) Ribosomes
- c) Vacuoles
- d) Peroxisomes

10. Chloroplasts contain the pigment:

- a) Haemoglobin
- b) Melanin
- c) Chlorophyll
- d) Carotene only

11. The powerhouse of the cell is the:

- a) Nucleus
- b) Golgi body
- c) Mitochondrion
- d) Lysosome

12. Ribosomes are the site of:

- a) Lipid synthesis
- b) Protein synthesis
- c) DNA replication
- d) RNA degradation

13. Dictyosomes in plant cells are equivalent to:

- a) Mitochondria
- b) Golgi apparatus
- c) Lysosomes
- d) Peroxisomes

14. The large central vacuole in plant cells helps in:

- a) Photosynthesis
- b) Turgor pressure maintenance

c) Protein synthesis

d) Cell division

15. Mitosis results in:

- a) Four haploid daughter cells
- b) Two genetically identical diploid daughter cells
- c) Two genetically different haploid cells
- d) Four diploid daughter cells

16. Crossing over occurs during which stage of meiosis?

- a) Prophase I
- b) Metaphase II
- c) Anaphase I
- d) Telophase II

17. The phase of the cell cycle during which DNA replicates is:

- a) G1 phase
- b) S phase
- c) G2 phase
- d) M phase

18. Who is regarded as the father of genetics?

- a) Charles Darwin
- b) Gregor Mendel
- c) Francis Crick
- d) Thomas Hunt Morgan

19. The law of segregation states that alleles separate during:

- a) Fertilization
- b) Gamete formation
- c) DNA replication
- d) Translation

20. A test cross involves crossing an individual of unknown genotype with a:

- a) Homozygous dominant
- b) Homozygous recessive
- c) Heterozygous
- d) Wild type

21. Incomplete dominance is observed in:

- a) Pea plant height
- b) Snapdragon flower colour
- c) Drosophila eye colour
- d) Human blood groups

22. DNA replication is described as semi-conservative because:

- a) Both strands are newly synthesised
- b) Both strands are conserved
- c) Each new DNA has one parental and one new strand
- d) It uses RNA as a template

23. The genetic code is degenerate, meaning:

- a) One codon codes for multiple amino acids

b) Multiple codons can code for the same amino acid

c) The code differs between organisms

d) Each codon specifies a stop signal

24. Transcription is the process of synthesising:

- a) DNA from RNA
- b) Protein from RNA
- c) RNA from DNA
- d) DNA from protein

25. Translation occurs in the:

- a) Nucleus
- b) Ribosome
- c) Lysosome
- d) Golgi apparatus

26. The lac operon in *E. coli* is induced by:

- a) Glucose
- b) Lactose
- c) Tryptophan
- d) cAMP alone

27. Aneuploidy refers to:

- a) Complete set of chromosomes
- b) Change in the number of individual chromosomes
- c) Structural rearrangement of chromosomes
- d) Polyploidy

28. A chromosome lacking a segment is said to have a:

- a) Duplication
- b) Inversion
- c) Deletion
- d) Translocation

29. Down syndrome in humans is an example of:

- a) Monosomy
- b) Trisomy 21
- c) Polyploidy
- d) Inversion

30. Darwin's theory of evolution is based on:

- a) Inheritance of acquired characters
- b) Natural selection
- c) Use and disuse of organs
- d) Punctuated equilibrium

31. Multiple alleles exist for a gene when:

- a) One allele has multiple effects
- b) More than two alleles exist in a population
- c) Two genes affect the same trait
- d) One allele masks another

32. Lethal alleles are often detected by:

- a) 3:1 ratio
- b) Distorted Mendelian ratios
- c) Complementation tests

d) Linkage mapping

33. Penetrance refers to the:

- a) Degree of expression of a genotype
- b) Percentage of individuals with a genotype showing the phenotype
- c) Number of alleles at a locus
- d) Linkage between genes

34. The phenomenon of linkage was discovered by:

- a) Mendel
- b) Morgan
- c) Bateson and Punnett
- d) Watson

35. A map unit (centimorgan) corresponds to:

- a) 10% recombination
- b) 1% recombination
- c) 50% recombination
- d) 0.1% recombination

36. In a three-point testcross, double recombinants are used to:

- a) Confirm linkage
- b) Determine gene order
- c) Calculate interference
- d) Both b and c

37. Interference in genetics refers to:

- a) Increased crossing over
- b) Inhibition of additional crossovers near a crossover site
- c) Non-disjunction
- d) Translocation

38. Human chromosome mapping by recombination relies on:

- a) Bacterial transformation
- b) Pedigree analysis
- c) Somatic cell hybrids
- d) Electron microscopy

39. Which technique allows the analysis of single meioses?

- a) Tetrad analysis
- b) Testcross
- c) Backcross
- d) Complementation

40. Mitotic recombination can lead to:

- a) Only homozygous cells
- b) Loss of heterozygosity in somatic cells
- c) Formation of gametes
- d) Polyploidy

41. Bacterial conjugation involves transfer of DNA through:

- a) Phage
- b) Pilus

c) Transformation

d) Transposon

42. The F factor in E. coli is a:

- a) Bacteriophage
- b) Plasmid
- c) Chromosomal gene
- d) Ribosome

43. In bacterial transformation, DNA is taken up from:

- a) Another bacterium via pilus
- b) A bacteriophage
- c) The surrounding environment
- d) Mitochondria

44. Generalized transduction is mediated by:

- a) F plasmid
- b) Lytic phages
- c) Conjugation pilus
- d) Transposons

45. The genetic material of most organisms is:

- a) Protein
- b) RNA
- c) DNA
- d) Lipid

46. In eukaryotes, DNA replication occurs in the:

- a) Cytoplasm
- b) Nucleus
- c) Ribosome
- d) Mitochondria only

47. The "one gene – one enzyme" hypothesis was proposed by Beadle and Tatum using:

- a) *Drosophila*
- b) *Neurospora*
- c) Pea plants
- d) Maize

48. A complementation test determines whether two mutations are:

- a) In the same gene
- b) In different genes
- c) Both dominant
- d) Both lethal

49. The genetic code is read in triplets called:

- a) Anticodons
- b) Codons
- c) Exons
- d) Introns

50. The wobble hypothesis explains:

- a) DNA supercoiling
- b) Flexibility in the base pairing of codon-anticodon interaction

- c) Protein folding
- d) Transcription termination

51. In eukaryotic mRNA, the 5' cap and 3' poly-A tail function in:

- a) Splicing
- b) Stability and translation initiation
- c) Replication
- d) Transcription

52. Cytoplasmic inheritance in plants is often shown by:

- a) Mendelian 3:1 ratios
- b) Variegated leaves
- c) Sex-linked traits
- d) Autosomal dominance

53. Mitochondrial genes in yeast are known for:

- a) Governing antibiotic resistance
- b) Determining mating type
- c) Phage resistance
- d) Nitrogen fixation

54. Crown gall disease in plants is caused by:

- a) Virus
- b) *Agrobacterium tumefaciens*
- c) Fungus
- d) Nematode

55. Cancer can be considered a developmental genetic disease because it involves:

- a) Programmed cell death only
- b) Mutations in genes regulating cell division and differentiation
- c) Bacterial infection
- d) Viral capsid assembly

56. According to the Hardy–Weinberg law, allele frequencies in a population remain constant in the absence of:

- a) Mutation and selection
- b) Migration and genetic drift
- c) Non-random mating
- d) All of the above

57. If the frequency of a recessive allele is 0.3, the expected frequency of homozygous recessives under Hardy–Weinberg equilibrium is:

- a) 0.09
- b) 0.42
- c) 0.49
- d) 0.30

58. Superhelical DNA is typically found in:

- a) Linear eukaryotic chromosomes
- b) Circular DNA molecules like bacterial plasmids
- c) Single-stranded RNA
- d) Denatured protein

59. DNA renaturation is the process of:

- a) Separating double strands
- b) Re-annealing complementary single strands
- c) Degradation of DNA
- d) Synthesis of new DNA

60. Nucleic acid hybridization is used to:

- a) Sequence proteins
- b) Detect specific nucleotide sequences
- c) Purify lipids
- d) Fold proteins

61. The central dogma of molecular biology describes the flow of information from:

- a) Protein → RNA → DNA
- b) DNA → RNA → Protein
- c) RNA → DNA → Protein
- d) Protein → DNA → RNA

62. The α -helix and β -pleated sheet are examples of:

- a) Primary structure of proteins
- b) Secondary structure of proteins
- c) Tertiary structure
- d) Quaternary structure

63. Protein purification often uses chromatography based on:

- a) Charge and size
- b) Only colour
- c) DNA sequence

d) Lipid solubility

64. The enzyme that synthesises RNA during transcription is:

- a) DNA polymerase
- b) RNA polymerase
- c) Reverse transcriptase
- d) Helicase

65. A polycistronic mRNA is typically found in:

- a) Eukaryotes
- b) Prokaryotes
- c) Viruses only
- d) Plants only

66. Overlapping genes are genes that:

- a) Share the same regulatory sequence
- b) Encode the same protein
- c) Share nucleotide sequences encoding different proteins
- d) Are duplicated

67. A major difference between prokaryotic and eukaryotic gene regulation is:

- a) Prokaryotes have introns
- b) Eukaryotes use operons extensively
- c) Eukaryotes have more complex regulation including chromatin remodelling
- d) Prokaryotes lack promoters

68. Splicing of eukaryotic pre-mRNA involves removal of:

- a) Exons
- b) Introns
- c) Promoters
- d) Poly-A tail

69. A cDNA library is constructed using:

- a) Genomic DNA
- b) mRNA as a template
- c) Proteins
- d) Lipids

70. DNA microarrays are used in functional genomics to:

- a) Sequence whole genomes
- b) Analyse gene expression levels of thousands of genes
- c) Purify proteins
- d) Study protein folding

71. Structural proteomics focuses on:

- a) Protein-protein interactions only
- b) Three-dimensional structures of proteins
- c) DNA sequencing
- d) Metabolic pathways

72. Metabolomics is the study of:

- a) Genes
- b) mRNA transcripts
- c) Metabolites in a biological system

d) Proteins

73. Bioinformatics primarily combines biology with:

- a) Sociology
- b) Computer science
- c) Geology
- d) Physics only

74. In bioinformatics, “docking” refers to:

- a) Cloning a gene
- b) Predicting the interaction between a protein and a ligand
- c) DNA sequencing
- d) PCR amplification

75. Restriction enzymes are used in recombinant DNA technology to:

- a) Join DNA fragments
- b) Cut DNA at specific sequences
- c) Synthesise DNA
- d) Amplify DNA

76. The polymerase chain reaction (PCR) is used to:

- a) Cut DNA
- b) Amplify specific DNA sequences
- c) Sequence proteins
- d) Separate DNA fragments

77. In RT-PCR, the enzyme reverse transcriptase is used to:

- a) Amplify DNA directly
- b) Synthesise cDNA from mRNA
- c) Join DNA fragments
- d) Digest proteins

78. Plasmids are used as vectors because they:

- a) Cannot replicate
- b) Are large linear DNA molecules
- c) Can replicate independently in bacteria
- d) Are viral particles

79. Site-directed mutagenesis allows:

- a) Random mutation throughout the genome
- b) Introduction of specific mutations at defined sites in DNA
- c) Whole genome sequencing
- d) Protein purification

80. DNA sequencing by the Sanger method uses:

- a) Radioactive amino acids
- b) Dideoxynucleotides
- c) DNA microarray
- d) Restriction enzymes

81. Transgenic plants are created by:

- a) Hybridization only
- b) Introducing foreign genes into the plant genome

c) Mutagenesis

d) Polyploidy induction

82. DNA typing (genetic fingerprinting) is based on:

a) Protein variations

b) Polymorphic DNA sequences such as STRs

c) Mitochondrial number

d) Cell size

83. Gene therapy aims to treat diseases by:

a) Removing faulty proteins

b) Introducing functional genes into patient cells

c) Irradiating tumours

d) Using antibiotics

84. A spontaneous mutation arises from:

a) Exposure to UV radiation

b) Chemical mutagens

c) Natural errors in DNA replication

d) Transposon insertion only

85. Mutagens and carcinogens are often identified using the:

a) Ames test

b) Complementation test

c) Testcross

d) Hardy–Weinberg equilibrium

86. The Holliday model describes:

a) DNA replication

b) Homologous recombination

c) Translation

d) Transcription

87. Site-specific recombination is used by bacteriophage λ to:

a) Replicate its DNA

b) Integrate into the host chromosome

c) Form capsids

d) Lyse the host

88. Insertion sequences (IS elements) are:

a) Large plasmids

b) Simple transposable elements in bacteria

c) Eukaryotic viruses

d) Structural genes

89. Transposons in maize were discovered by:

a) Mendel

b) Barbara McClintock

c) Watson

d) Beadle

90. The main goal of the Human Genome Project was to:

a) Clone all human genes in bacteria

b) Determine the sequence of the entire human genome

c) Create transgenic humans

d) Map all plant genomes

91. The plant model organism *Arabidopsis thaliana* is favoured because of its:

- a) Large genome and long life cycle
- b) Small genome and short generation time
- c) Complex polyploidy
- d) Woody stem

92. Bioinformatics tools like BLAST are used for:

- a) Protein crystallization
- b) Sequence similarity searching
- c) DNA extraction
- d) Cell culture

93. Bioethics deals with ethical issues arising from:

- a) Classical plant taxonomy
- b) Advances in biology and medicine
- c) Chemical bonding
- d) Ecological succession

94. Bioenergetics concerns:

- a) Genetic code
- b) Energy transformations in living organisms
- c) Protein structure
- d) Phylogeny

95. The first law of thermodynamics states that energy:

- a) Always increases in a system

b) Can be created

c) Can be transformed but not created or destroyed

d) Decreases in all reactions

96. β -oxidation is the process of:

- a) Glucose breakdown
- b) Fatty acid degradation
- c) Protein synthesis
- d) DNA repair

97. Biosynthesis of fatty acids occurs in the:

- a) Mitochondrial matrix
- b) Cytoplasm (in plants, plastids)
- c) Nucleus
- d) Lysosome

98. Reverse transcription is carried out by:

- a) DNA polymerase I
- b) RNA polymerase
- c) Reverse transcriptase
- d) Helicase

99. In protein synthesis, the initiation codon is usually:

- a) UAA
- b) UAG
- c) AUG
- d) UGA

100. Alkaloids are:

- a) Acidic nitrogen-containing compounds
- b) Basic nitrogen-containing secondary metabolites
- c) Neutral lipids
- d) Sulphur-containing carbohydrates

101. Solanine is an alkaloid found in:

- a) Tea leaves
- b) Potato
- c) Opium poppy
- d) Coffee beans

102. Aflatoxins are toxic compounds produced by:

- a) Penicillium
- b) Aspergillus flavus
- c) Saccharomyces
- d) E. coli

103. Monoterpenes contain how many isoprene units?

- a) 1
- b) 2
- c) 3
- d) 4

104. Triterpenes are precursors of:

- a) Chlorophyll
- b) Steroids
- c) Carotenoids

d) Alkaloids

105. Which vitamin is essential for calcium metabolism and bone health?

- a) Vitamin A
- b) Vitamin C
- c) Vitamin D
- d) Vitamin B12

106. In photosynthesis, the light reactions produce:

- a) Glucose directly
- b) ATP and NADPH
- c) CO₂ and H₂O
- d) Only oxygen

107. RuBisCO catalyses the fixation of CO₂ to:

- a) Glucose
- b) Ribulose-1,5-bisphosphate
- c) 3-phosphoglycerate
- d) Pyruvate

108. The C₄ pathway is an adaptation to:

- a) Low light
- b) High CO₂ and low O₂
- c) High temperature and water stress
- d) Low nitrogen

109. Starch synthesis in chloroplasts primarily uses:

- a) Glucose-1-phosphate

b) ADP-glucose

c) Sucrose

d) Fructose

110. Cellulose is a polymer of:

a) α -glucose

b) β -glucose

c) Fructose

d) Sucrose

111. Sucrose is transported in plants mainly through:

a) Xylem

b) Phloem

c) Cortex

d) Epidermis

112. Fatty acids are long-chain hydrocarbons with a:

a) Carboxyl group at one end

b) Amino group

c) Phosphate group

d) Aldehyde group

113. Phospholipids are amphipathic because they have:

a) Only hydrophobic regions

b) Hydrophilic head and hydrophobic tails

c) Only saturated fatty acids

d) Sterol backbone

114. The primary structure of a protein refers to:

a) α -helices

b) Sequence of amino acids

c) Three-dimensional folding

d) Subunit association

115. Disulfide bonds are important in maintaining:

a) Primary structure

b) Tertiary structure of some proteins

c) Secondary structure only

d) Only quaternary structure

116. Protein targeting ensures that proteins are delivered to:

a) The correct cellular compartment

b) Only the cytoplasm

c) The nucleus only

d) Lysosome only

117. Defensins are plant proteins involved in:

a) Photosynthesis

b) Defence against pathogens

c) Starch synthesis

d) Lipid transport

118. Purine bases include:

a) Adenine and guanine

b) Cytosine and thymine

c) Cytosine and uracil

d) Thymine and uracil

119. The sugar in RNA is:

a) Deoxyribose

b) Ribose

c) Glucose

d) Sucrose

120. mRNA carries genetic information from:

a) Ribosome to nucleus

b) Nucleus to ribosome

c) Mitochondria to cytoplasm

d) Vacuole to cell wall

121. Enzymes are classified into six major classes by the:

a) WHO

b) International Union of Biochemistry (IUB)

c) FAO

d) NCBI

122. Isozymes are:

a) Different enzymes catalysing different reactions

b) Multiple forms of an enzyme catalysing the same reaction

c) Enzymes that require cofactors

d) Non-protein enzymes

123. Ribozymes are:

a) RNA molecules with catalytic activity

b) Protein enzymes

c) Lipid-based catalysts

d) Artificial enzymes

124. Allosteric enzymes typically show:

a) Michaelis–Menten kinetics

b) Sigmoidal kinetics

c) Linear kinetics

d) Irreversible inhibition

125. Feedback inhibition often involves the end-product of a pathway inhibiting the:

a) Last enzyme

b) First committed step enzyme

c) Transport protein

d) Receptor

126. The isoprenoid pathway leads to the synthesis of:

a) Alkaloids

b) Sterols and terpenes

c) Carbohydrates

d) Amino acids

127. Which of the following is a diterpene?

a) Limonene

b) Gibberellic acid

c) β -carotene

d) Squalene

128. Enzymes increase reaction rates by:

- a) Changing the equilibrium constant
- b) Lowering activation energy
- c) Increasing substrate concentration
- d) Inhibiting products

129. Abzymes are:

- a) Catalytic antibodies
- b) Enzymes that digest antibodies
- c) RNA enzymes
- d) Synthetic cofactors

130. The cell cycle checkpoint that ensures DNA replication is complete occurs in:

- a) G1
- b) S
- c) G2
- d) M

131. Meiosis II is similar to mitosis because:

- a) Homologous chromosomes pair
- b) Sister chromatids separate
- c) Crossing over occurs
- d) DNA replicates beforehand

132. In Mendel's dihybrid cross, the F₂ phenotypic ratio is:

- a) 3:1
- b) 1:2:1

c) 9:3:3:1

d) 1:1:1:1

133. A backcross is a cross of an F₁ hybrid with:

- a) Another F₁ hybrid
- b) One of its parents
- c) A homozygous recessive
- d) An unrelated individual

134. The enzyme DNA ligase functions in DNA replication to:

- a) Unwind the helix
- b) Synthesise new strands
- c) Join Okazaki fragments
- d) Remove RNA primers

135. The genetic code is non-overlapping, meaning:

- a) Codons share nucleotides
- b) Each nucleotide is read only once in one codon
- c) Genes overlap
- d) Codons are separated by spacers

136. In the lac operon, the repressor protein binds to the:

- a) Promoter
- b) Operator
- c) Structural gene
- d) Terminator

137. A person with Klinefelter syndrome has the chromosomal constitution:

- a) 45, XO
- b) 47, XXY
- c) 47, XXX
- d) 47, XYY

138. A Robertsonian translocation involves:

- a) Exchange of segments between non-homologous chromosomes
- b) Inversion of a segment
- c) Fusion of two acrocentric chromosomes
- d) Duplication of a segment

139. In duplicate dominant epistasis, the F_2 ratio is:

- a) 9:7
- b) 15:1
- c) 13:3
- d) 9:3:4

140. Expressivity refers to the:

- a) Proportion of individuals showing the phenotype
- b) Degree to which a genotype is expressed phenotypically
- c) Number of alleles
- d) Linkage distance

141. In a testcross of a dihybrid (AaBb), if genes are unlinked, the expected ratio is:

- a) 1:1:1:1

b) 9:3:3:1

c) 1:2:1

d) 3:1

142. Positive interference means that observed double crossover frequency is:

- a) Equal to expected
- b) Greater than expected
- c) Less than expected
- d) Zero

143. Somatic cell hybridization is used in human mapping to:

- a) Synthesise proteins
- b) Assign genes to chromosomes
- c) Clone animals
- d) Create transgenic bacteria

144. Hfr strains of E. coli are characterized by:

- a) Absence of F plasmid
- b) Integrated F plasmid in the chromosome
- c) Lack of conjugation ability
- d) Phage resistance

145. Specialized transduction transfers only:

- a) Any random bacterial gene
- b) Bacterial genes adjacent to the prophage site
- c) Plasmid genes
- d) F factor

146. DNA replication in eukaryotes differs from prokaryotes by having:

- a) A single origin of replication
- b) Multiple origins of replication
- c) Circular chromosomes
- d) No need for primers

147. A codon is a sequence of three nucleotides on:

- a) tRNA
- b) mRNA
- c) rRNA
- d) DNA

148. The TATA box is a:

- a) Transcriptional terminator in prokaryotes
- b) Promoter element in eukaryotes
- c) Enhancer sequence
- d) Origin of replication

149. Variegation in four o'clock plants is due to:

- a) Nuclear gene mutation
- b) Chloroplast gene mutation
- c) Viral infection
- d) X-linked inheritance

150. Chlamydomonas is a model organism for studying:

- a) Cancer genetics
- b) Extranuclear inheritance

c) Human diseases

d) Bacterial conjugation

151. Plasmids in eukaryotes can be found in:

- a) Nucleus only
- b) Mitochondria and chloroplasts
- c) Cell wall
- d) Golgi body

152. In population genetics, genetic drift refers to:

- a) Migration of individuals
- b) Random changes in allele frequencies in small populations
- c) Natural selection
- d) Assortative mating

153. A gene pool is the sum of all alleles:

- a) In an individual
- b) In a population
- c) On one chromosome
- d) In a species worldwide

154. DNA sequencing using dideoxynucleotides relies on:

- a) Chain termination
- b) Chain elongation
- c) Protein binding
- d) Hybridization only

155. The α -helix is stabilised by:

- a) Disulfide bonds
- b) Hydrogen bonds between backbone –NH and –CO groups
- c) Hydrophobic interactions
- d) Ionic bonds between side chains

156. In the wobble hypothesis, the base inosine in tRNA can pair with:

- a) A only
- b) U, C, or A
- c) G only
- d) T only

157. Enhancers are DNA sequences that:

- a) Repress transcription
- b) Increase transcription of a gene, often at a distance
- c) Terminate transcription
- d) Initiate replication

158. A microarray chip contains:

- a) Known DNA sequences spotted in a grid
- b) Antibodies
- c) Living cells
- d) Radioactive proteins

159. Two-dimensional gel electrophoresis separates proteins based on:

- a) Size and charge
- b) Colour and shape

- c) Only mass
- d) Only hydrophobicity

160. Metabolomics often uses techniques such as:

- a) PCR
- b) NMR and mass spectrometry
- c) DNA sequencing
- d) Microscopy

161. The purpose of a genomic DNA library is to:

- a) Store cDNA clones
- b) Represent the entire genome of an organism in clones
- c) Sequence proteins
- d) Amplify RNA

162. In recombinant DNA technology, alkaline phosphatase is used to:

- a) Join DNA
- b) Prevent self-ligation of plasmid vector
- c) Synthesise DNA
- d) Cut DNA

163. A selectable marker gene in a plasmid vector often confers:

- a) Fluorescence
- b) Antibiotic resistance
- c) Protein secretion
- d) Lipid synthesis

164. Real-time PCR (qPCR) allows:

- a) Only end-point detection
- b) Quantification of DNA amplification in real time
- c) Protein analysis
- d) DNA visualisation without gel

165. Site-directed mutagenesis can be used to create:

- a) Random mutants
- b) Specific amino acid changes in a protein
- c) Complete genomes
- d) Transgenic animals only

166. Gene therapy using viral vectors risks:

- a) Immune response and insertional mutagenesis
- b) Overproduction of protein
- c) Antibiotic resistance
- d) Photosensitivity

167. The Ames test uses Salmonella strains to detect:

- a) DNA repair
- b) Mutagens
- c) Gene expression
- d) Protein folding

168. The RecA protein in E. coli is essential for:

- a) DNA replication
- b) Homologous recombination

c) Transcription

d) Translation

169. Transposons can cause mutations by:

- a) Enhancing gene expression only
- b) Inserting into a gene and disrupting its function
- c) Deleting whole chromosomes
- d) Replicating plasmids

170. The Ac-Ds system in maize is an example of:

- a) Simple insertion sequences
- b) A two-component transposable element system
- c) Retrovirus integration
- d) Plasmid transfer

171. The human genome consists of approximately:

- a) 3 million base pairs
- b) 3 billion base pairs
- c) 30 billion base pairs
- d) 300 million base pairs

172. Arabidopsis genome sequencing was completed in the year:

- a) 1990
- b) 2000
- c) 2005
- d) 2010

173. BLAST is an acronym for:

- a) Basic Local Alignment Search Tool
- b) Binary Large Alignment Sequence Tool
- c) Basic Linkage Analysis System
- d) Biological Logical Alignment Software

174. The term “bioethics” was first used in the context of:

- a) Plant breeding
- b) Human experimentation and medical ethics
- c) Animal classification
- d) Bioinformatics

175. The conversion of glucose to pyruvate is called:

- a) Gluconeogenesis
- b) Glycolysis
- c) Beta-oxidation
- d) Calvin cycle

176. Sucrose is a disaccharide composed of:

- a) Glucose and galactose
- b) Glucose and fructose
- c) Two glucose molecules
- d) Glucose and maltose

177. In β -oxidation, fatty acyl-CoA is shortened by how many carbon atoms per cycle?

- a) 1
- b) 2
- c) 3

d) 4

178. The energy currency of cells is:

- a) NADH
- b) ATP
- c) FADH₂
- d) GTP

179. Reverse transcriptase is found in:

- a) All bacteria
- b) Retroviruses
- c) Plants only
- d) Mitochondria only

180. Which alkaloid is a major stimulant in coffee and tea?

- a) Solanine
- b) Nicotine
- c) Caffeine
- d) Morphine

181. Morphine is derived from:

- a) Coffea arabica
- b) Papaver somniferum
- c) Nicotiana tabacum
- d) Solanum tuberosum

182. Lycopene, a tetraterpene, is the red pigment in:

- a) Carrots

b) Tomatoes

c) Spinach

d) Potatoes

183. Vitamin C is also known as:

a) Retinol

b) Ascorbic acid

c) Calciferol

d) Tocopherol

184. The light-harvesting complexes in chloroplasts are part of:

a) Photosystem I and II

b) Calvin cycle enzymes

c) Rubisco

d) ATP synthase only

185. Photorespiration occurs when RuBisCO fixes:

a) CO₂ only

b) O₂ instead of CO₂

c) Nitrogen

d) Water

186. C₄ plants initially fix CO₂ into:

a) 3-phosphoglycerate

b) Oxaloacetate, a four-carbon acid

c) Glucose

d) Glycerate

187. The pentose phosphate pathway produces:

a) ATP and NADH

b) NADPH and ribose-5-phosphate

c) FADH₂

d) Amino acids

188. In plants, carbon is exported from chloroplasts mainly as:

a) Starch

b) Triose phosphates

c) Glucose

d) Fructose

189. Plant cell wall cellulose is synthesised by:

a) Golgi-localised enzymes

b) Plasma membrane rosette complexes

c) Mitochondria

d) Vacuole

190. A fatty acid with no double bonds is termed:

a) Polyunsaturated

b) Monounsaturated

c) Saturated

d) Trans fatty acid

191. Glycerol combines with three fatty acids to form:

a) Phospholipid

b) Triglyceride

c) Wax

d) Steroid

192. Which amino acid contains sulfur?

a) Glycine

b) Methionine

c) Alanine

d) Serine

193. Beta-sheets are stabilised by:

a) Disulfide bonds

b) Hydrogen bonds between polypeptide strands

c) Peptide bonds

d) Glycosidic bonds

194. Chaperone proteins assist in:

a) DNA replication

b) Protein folding

c) Lipid synthesis

d) RNA degradation

195. Ubiquitination targets proteins for:

a) Secretion

b) Proteasomal degradation

c) Folding

d) Glycosylation

196. Adenine pairs with thymine in DNA by:

a) Three hydrogen bonds

b) Two hydrogen bonds

c) One hydrogen bond

d) Covalent bond

197. The melting temperature (T_m) of DNA is higher when the content of:

a) A-T is higher

b) G-C is higher

c) A-T equals G-C

d) DNA is single-stranded

198. RNA polymerase II synthesises:

a) tRNA

b) rRNA

c) mRNA and some snRNA

d) 5S rRNA

199. An abzyme is generated by immunising with:

a) A pathogen

b) A transition-state analogue

c) An enzyme substrate

d) A hapten only

200. The active site of an enzyme generally:

a) Is a large region covering the whole surface

b) Is a small pocket or cleft formed by a few amino acids

c) Binds cofactors only

d) Binds allosteric effectors

201. Glycogen is the main storage polysaccharide in:

- a) Plants
- b) Animals
- c) Bacteria
- d) Fungi cell walls

202. Which nitrogenous base is found in RNA but not in DNA?

- a) Thymine
- b) Uracil
- c) Adenine
- d) Guanine

203. The cell wall of fungi is composed of:

- a) Cellulose
- b) Peptidoglycan
- c) Chitin
- d) Lignin

204. Lysosomes contain hydrolytic enzymes and function at:

- a) Neutral pH
- b) Acidic pH
- c) Alkaline pH
- d) Variable pH without optimum

205. In plant cells, cytokinesis occurs by:

- a) Cleavage furrow
- b) Cell plate formation
- c) Binary fission
- d) Budding

206. Synapsis of homologous chromosomes is characteristic of:

- a) Mitosis prophase
- b) Meiosis prophase I
- c) Meiosis prophase II
- d) G2 phase

207. Mendel's law of independent assortment applies to genes located:

- a) On the same chromosome
- b) On different chromosomes
- c) At the same locus
- d) On the X chromosome only

208. A recessive allele is expressed only in:

- a) Heterozygous condition
- b) Homozygous condition
- c) Presence of dominant allele
- d) Haploid cells only

209. The enzyme helicase functions during DNA replication to:

- a) Unwind the double helix
- b) Synthesise primers

c) Seal nicks

d) Proofread

210. Which molecule carries an anticodon?

a) mRNA

b) tRNA

c) rRNA

d) snRNA

211. In the lac operon, the inducer is:

a) Glucose

b) Allolactose

c) cAMP

d) Tryptophan

212. A translocation in which two non-homologous chromosomes exchange segments is called:

a) Duplication

b) Inversion

c) Reciprocal translocation

d) Deletion

213. Turner syndrome in humans has the karyotype:

a) 47, XXY

b) 45, X

c) 47, XXX

d) 46, XY

214. The theory of use and disuse was proposed by:

a) Darwin

b) Lamarck

c) Weismann

d) Wallace

215. In codominance, both alleles:

a) Blend

b) Are equally expressed in the heterozygote

c) Are lethal

d) Exhibit incomplete penetrance

216. The ABO blood group system is an example of:

a) Polygenic inheritance

b) Multiple alleles and codominance

c) Incomplete dominance

d) Sex-linkage

217. Recombination frequency between two genes cannot exceed:

a) 100%

b) 50%

c) 25%

d) 10%

218. A three-point testcross uses a parent that is:

a) Homozygous dominant at all loci

b) Triple heterozygote testcrossed with a triple recessive

c) Homozygous recessive at all loci

d) Haploid

219. In *Neurospora*, ordered tetrads allow mapping of a gene relative to the:

- a) Nucleus
- b) Centromere
- c) Mitochondria
- d) Ribosome

220. An F' (F prime) factor is formed when:

- a) F plasmid is lost
- b) F plasmid excises imprecisely, carrying chromosomal genes
- c) Bacteriophage integrates
- d) Conjugation occurs with Hfr

221. In specialized transduction, the phage that mediates it is typically:

- a) Virulent
- b) Temperate
- c) Lytic only
- d) An RNA phage

222. The Hershey–Chase experiment confirmed that the genetic material is:

- a) Protein
- b) RNA
- c) DNA
- d) Lipid

223. Telomerase is an enzyme that:

- a) Degrades telomeres
- b) Extends telomeres in germ cells and stem cells
- c) Initiates DNA replication
- d) Seals Okazaki fragments

224. A complementation group defines a:

- a) Chromosome
- b) Gene
- c) Promoter
- d) Operon

225. In eukaryotes, RNA polymerase I transcribes:

- a) mRNA
- b) tRNA
- c) rRNA (except 5S)
- d) snRNA

226. Alternative splicing allows:

- a) One gene to code for multiple proteins
- b) DNA to be cut differently
- c) Proteins to fold into different shapes
- d) Recombination to vary

227. Cytoplasmic male sterility in plants is often associated with:

- a) Nuclear genes only
- b) Mitochondrial genes
- c) Chloroplast genes

d) Viral infection

228. Petite mutants in yeast are defective in:

a) Mating type

b) Mitochondrial function

c) Cell wall synthesis

d) Nuclear division

229. The Ti plasmid is used to create transgenic plants because it:

a) Kills plant cells

b) Transfers T-DNA into plant genome

c) Cannot be manipulated

d) Is a virus

230. In Hardy–Weinberg equilibrium, the frequency of heterozygotes is:

a) p^2

b) $2pq$

c) q^2

d) p^2+q^2

231. DNA denaturation can be monitored by measuring:

a) Protein concentration

b) Absorbance at 260 nm (hyperchromicity)

c) Absorbance at 280 nm

d) Viscosity only

232. Southern blotting is a technique to detect specific:

a) RNA

b) Proteins

c) DNA sequences

d) Lipids

233. The β -sheet can be parallel or antiparallel, referring to the:

a) Orientation of the sheet in space

b) Direction of the polypeptide strands

c) Number of strands

d) Type of amino acids

234. SDS-PAGE separates proteins primarily by:

a) Charge

b) Molecular weight

c) Isoelectric point

d) Solubility

235. The Pribnow box is a promoter element in:

a) Eukaryotes

b) Prokaryotes

c) Viruses only

d) Archaea

236. RNA interference (RNAi) is a mechanism of:

a) Enhancing transcription

b) Post-transcriptional gene silencing

c) DNA repair

d) Protein activation

237. A cDNA library contains only:

- a) Introns
- b) Expressed genes (exons)
- c) Regulatory sequences
- d) Telomeres

238. In a yeast two-hybrid system, one studies:

- a) DNA replication
- b) Protein-protein interactions
- c) mRNA splicing
- d) Lipid metabolism

239. Mass spectrometry in proteomics is used to:

- a) Amplify DNA
- b) Identify and quantify proteins
- c) Sequence genomes
- d) Visualize tissues

240. In silico analysis refers to:

- a) Laboratory experiments
- b) Computer-based simulations and analyses
- c) Field studies
- d) Microscopy

241. Sticky ends generated by restriction enzymes are:

- a) Blunt ends
- b) Single-stranded overhangs that can base-pair

c) Methylated ends

d) Phosphorylated only

242. A shuttle vector is a plasmid that can replicate in:

- a) Only one host
- b) Two different host species (e.g., E. coli and yeast)
- c) Only eukaryotic cells
- d) Only prokaryotes

243. Reverse transcriptase PCR (RT-PCR) is used to:

- a) Sequence DNA
- b) Amplify RNA sequences after conversion to cDNA
- c) Detect proteins
- d) Clone whole genomes

244. Mutations that restore the wild-type phenotype are called:

- a) Forward mutations
- b) Suppressor mutations
- c) Lethal mutations
- d) Conditional mutations

245. Photoreactivation repair directly reverses:

- a) Double-strand breaks
- b) Thymine dimers
- c) Alkylation damage
- d) Mismatches

246. The RecBCD complex in E. coli is involved in:

- a) DNA replication initiation
- b) Homologous recombination
- c) Transposition
- d) Transcription termination

247. A composite transposon carries:

- a) Only insertion sequences
- b) A gene(s) flanked by two insertion sequences
- c) Only antibiotic resistance genes
- d) Phage genes

248. The human genome contains about how many protein-coding genes?

- a) 100,000
- b) 20,000–25,000
- c) 5000
- d) 200,000

249. The term “genomics” refers to the study of:

- a) A single gene
- b) The complete set of genes and their interactions
- c) Only protein structure
- d) Ecosystem dynamics

250. Ethical concerns about GMOs include:

- a) Uniform support from all communities
- b) Potential environmental impact and food safety
- c) Only religious approval
- d) No debate

251. An oxidation reaction involves:

- a) Gain of electrons
- b) Loss of electrons
- c) Addition of hydrogen
- d) Release of water

252. Glycolysis occurs in the:

- a) Mitochondrial matrix
- b) Cytoplasm
- c) Nucleus
- d) Chloroplast

253. In fatty acid biosynthesis, the carrier molecule is:

- a) Coenzyme A
- b) Acyl carrier protein (ACP)
- c) NADH
- d) Biotin

254. The stop codon UAA is known as:

- a) Amber
- b) Ochre
- c) Opal
- d) Sable

255. Nicotine is synthesized mainly in the:

- a) Flowers
- b) Roots of tobacco plants

c) Fruits

d) Seeds

256. Aflatoxin B1 primarily affects the:

a) Brain

b) Liver

c) Kidneys

d) Heart

257. Taxol, a diterpene, is used as a:

a) Antibiotic

b) Anticancer drug

c) Analgesic

d) Vitamin

258. β -carotene is a precursor of:

a) Vitamin D

b) Vitamin A

c) Vitamin E

d) Vitamin K

259. Which vitamin acts as a coenzyme in carboxylation reactions?

a) Riboflavin

b) Biotin

c) Niacin

d) Thiamine

260. The oxygen-evolving complex of PSII contains:

a) Iron-sulfur clusters

b) A manganese-calcium cluster

c) Copper

d) Zinc

261. The Calvin cycle takes place in the:

a) Thylakoid membrane

b) Stroma of chloroplast

c) Cytoplasm

d) Mitochondria

262. C3 plants differ from C4 plants in that their first stable product of carbon fixation is:

a) Malate

b) 3-PGA (3-carbon)

c) Oxaloacetate

d) PEP

263. Amylose is a component of starch that is:

a) Branched

b) Linear α -1,4-linked glucose polymer

c) Highly branched with α -1,6 linkages

d) A structural polysaccharide

264. Sucrose synthase catalyses the reversible conversion of sucrose and UDP to:

a) Glucose and fructose

b) UDP-glucose and fructose

c) Starch and glucose

d) ADP-glucose and glucose

265. The main sterol in animal membranes is cholesterol; in plant membranes it is:

- a) Ergosterol
- b) Stigmasterol
- c) Sitosterol
- d) Testosterone

266. A zwitterion is an amino acid form that has:

- a) Only negative charge
- b) Both positive and negative charges but net neutral
- c) Only positive charge
- d) No charge

267. The quaternary structure of haemoglobin consists of:

- a) Single polypeptide
- b) Two α and two β subunits
- c) One α and one β subunit
- d) Four identical subunits

268. Non-ribosomal peptides are synthesised by:

- a) Ribosomes
- b) Large multi-enzyme complexes (NRPSs)
- c) mRNA translation
- d) tRNA

269. The nucleotide ATP is composed of adenine, ribose, and:

- a) One phosphate
- b) Two phosphates
- c) Three phosphates
- d) No phosphate

270. Which type of RNA is a structural component of ribosomes?

- a) mRNA
- b) tRNA
- c) rRNA
- d) miRNA

271. The IUB class "Oxidoreductases" catalyse:

- a) Transfer of groups
- b) Oxidation-reduction reactions
- c) Hydrolysis
- d) Isomerization

272. A competitive inhibitor of an enzyme typically:

- a) Binds to the active site
- b) Binds to an allosteric site
- c) Permanently inactivates the enzyme
- d) Lowers V_{max}

273. The Michaelis constant (K_m) is defined as the substrate concentration at:

- a) Saturation

b) Half-maximum velocity

c) Maximum velocity

d) Zero velocity

274. Allosteric regulation of enzyme activity is often by:

a) Covalent modification only

b) Binding of effector molecules at a site other than the active site

c) Irreversible inhibition

d) Changes in pH only

275. Isopentenyl pyrophosphate (IPP) is a building block for:

a) Fatty acids

b) Terpenoids

c) Alkaloids

d) Amino acids

276. The quaternary ammonium alkaloid solanine is toxic due to its action as a:

a) Neurotoxin and membrane disruptor

b) Vitamin

c) Carbohydrate

d) Essential oil

277. The amino acid tyrosine is a precursor for:

a) Tryptophan

b) Morphine alkaloids

c) Serine

d) Valine

278. Which of the following is a sesquiterpene?

a) Limonene

b) Absciscic acid

c) Carotene

d) Gibberellin

279. Vitamin B1 (thiamine) deficiency causes:

a) Scurvy

b) Beriberi

c) Pellagra

d) Rickets

280. The light-dependent reactions of photosynthesis occur in the:

a) Stroma

b) Thylakoid membrane

c) Cytoplasm

d) Mitochondrial inner membrane

281. Cyclic photophosphorylation produces:

a) NADPH and ATP

b) ATP only

c) Oxygen and ATP

d) NADPH only

282. Rubisco activity is regulated by:

a) Light and CO₂ concentration

b) Magnesium ions and Rubisco activase

c) Temperature only

d) Lipid levels

283. In CAM plants, CO₂ fixation occurs at:

a) Day only

b) Night, with malate storage

c) Continuously

d) Dawn only

284. Starch phosphorylase catalyses the:

a) Hydrolysis of starch to glucose

b) Phosphorolytic cleavage of α -1,4 linkages in starch

c) Synthesis of amylose

d) Branching of amylopectin

285. The most abundant protein in the biosphere is:

a) Collagen

b) RuBisCO

c) Actin

d) Keratin

286. Sphingolipids are important components of:

a) Plant cell walls

b) Plant and animal cell membranes

c) Starch granules

d) Vacuolar sap

287. A peptide bond is formed between the:

a) Amino group and carboxyl group of two amino acids

b) Side chains of two amino acids

c) Phosphate and sugar

d) Base and sugar

288. The signal peptide directs proteins to the:

a) Nucleus

b) Endoplasmic reticulum

c) Mitochondrion only

d) Chloroplast only

289. Protein denaturation involves:

a) Breaking peptide bonds

b) Loss of higher-order structure without breaking primary structure

c) Synthesis of new amino acids

d) Formation of disulfide bonds

290. Defensins are small, cysteine-rich peptides with:

a) Antimicrobial activity

b) Enzymatic function in glycolysis

c) Hormonal activity

d) Photosynthetic role

291. The backbone of DNA consists of:

a) Alternating sugar and phosphate groups

b) Alternating nitrogenous bases

c) Lipid bilayer

d) Amino acids

292. The enzyme reverse transcriptase violates the central dogma because it synthesises:

- a) RNA from DNA
- b) DNA from RNA
- c) Protein from RNA
- d) DNA from protein

293. Ribozymes were first discovered in the self-splicing of:

- a) mRNA
- b) Group I intron of Tetrahymena rRNA
- c) tRNA
- d) snRNA

294. The transition state of an enzyme-catalysed reaction is:

- a) The lowest energy state
- b) A high-energy unstable state that the enzyme stabilises
- c) The free product
- d) The enzyme alone

295. The citric acid cycle takes place in the:

- a) Cytoplasm
- b) Mitochondrial matrix
- c) Nucleus
- d) Chloroplast stroma

296. One molecule of glucose yields how many net ATPs in glycolysis?

- a) 4
- b) 2
- c) 36
- d) 1

297. Which of the following is a phospholipid?

- a) Triacylglycerol
- b) Cholesterol
- c) Phosphatidylcholine
- d) Sucrose

298. In protein synthesis, the elongation factor EF-Tu in prokaryotes delivers:

- a) mRNA to ribosome
- b) Aminoacyl-tRNA to the A-site of ribosome
- c) Peptidyl transferase
- d) Stop codon

299. A nonsense mutation changes a codon to a:

- a) Different amino acid codon
- b) Stop codon
- c) Same amino acid codon
- d) Start codon

300. The universal nature of the genetic code suggests:

- a) All organisms use completely different codes
- b) A common evolutionary origin of life
- c) DNA is not the genetic material
- d) Mutations are impossible

Answer Key

1. c	27. b	53. a	79. b	105. c	131. b
2. b	28. c	54. b	80. b	106. b	132. c
3. c	29. b	55. b	81. b	107. b	133. b
4. b	30. b	56. d	82. b	108. c	134. c
5. c	31. b	57. a	83. b	109. b	135. b
6. c	32. b	58. b	84. c	110. b	136. b
7. c	33. b	59. b	85. a	111. b	137. b
8. b	34. c	60. b	86. b	112. a	138. c
9. b	35. b	61. b	87. b	113. b	139. b
10. c	36. d	62. b	88. b	114. b	140. b
11. c	37. b	63. a	89. b	115. b	141. a
12. b	38. b	64. b	90. b	116. a	142. c
13. b	39. a	65. b	91. b	117. b	143. b
14. b	40. b	66. c	92. b	118. a	144. b
15. b	41. b	67. c	93. b	119. b	145. b
16. a	42. b	68. b	94. b	120. b	146. b
17. b	43. c	69. b	95. c	121. b	147. b
18. b	44. b	70. b	96. b	122. b	148. b
19. b	45. c	71. b	97. b	123. a	149. b
20. b	46. b	72. c	98. c	124. b	150. b
21. b	47. b	73. b	99. c	125. b	151. b
22. c	48. b	74. b	100. b	126. b	152. b
23. b	49. b	75. b	101. b	127. b	153. b
24. c	50. b	76. b	102. b	128. b	154. a
25. b	51. b	77. b	103. b	129. a	155. b
26. b	52. b	78. c	104. b	130. c	156. b

157. b	185. b	213. b	241. b	269. c	297. c
158. a	186. b	214. b	242. b	270. c	298. b
159. a	187. b	215. b	243. b	271. b	299. b
160. b	188. b	216. b	244. b	272. a	300. b
161. b	189. b	217. b	245. b	273. b	
162. b	190. c	218. b	246. b	274. b	
163. b	191. b	219. b	247. b	275. b	
164. b	192. b	220. b	248. b	276. a	
165. b	193. b	221. b	249. b	277. b	
166. a	194. b	222. c	250. b	278. b	
167. b	195. b	223. b	251. b	279. b	
168. b	196. b	224. b	252. b	280. b	
169. b	197. b	225. c	253. b	281. b	
170. b	198. c	226. a	254. b	282. b	
171. b	199. b	227. b	255. b	283. b	
172. b	200. b	228. b	256. b	284. b	
173. a	201. b	229. b	257. b	285. b	
174. b	202. b	230. b	258. b	286. b	
175. b	203. c	231. b	259. b	287. a	
176. b	204. b	232. c	260. b	288. b	
177. b	205. b	233. b	261. b	289. b	
178. b	206. b	234. b	262. b	290. a	
179. b	207. b	235. b	263. b	291. a	
180. c	208. b	236. b	264. b	292. b	
181. b	209. a	237. b	265. c	293. b	
182. b	210. b	238. b	266. b	294. b	
183. b	211. b	239. b	267. b	295. b	
184. a	212. c	240. b	268. b	296. b	