

Introduction to Phytochemical Pathways – MCQs

80 Multiple-Choice Questions | Answer shown below each question

Note: Questions were prepared from the PDF content while excluding the pages marked with black X/lines.

1. What are primary metabolites?

- A. Compounds that are toxic to plants
- B. Compounds essential for life and growth
- C. Compounds produced only by medicinal plants
- D. Compounds with no physiological function

Answer: B

2. Which of the following is NOT considered a major primary metabolite?

- A. Carbohydrates
- B. Proteins
- C. Nucleic acids
- D. Alkaloids

Answer: D

3. Proteins are composed of:

- A. Sugar units
- B. Fatty acids
- C. Amino acids
- D. Nucleotides

Answer: C

4. Nucleic acids are based on:

- A. Amino acids
- B. Nucleotides
- C. Fatty acids
- D. Isoprene units

Answer: B

5. Which process converts sunlight energy into chemical energy in plants?

- A. Respiration
- B. Glycolysis
- C. Photosynthesis
- D. β -oxidation

Answer: C

6. Chlorophyll is located mainly in the:

- A. Nucleus
- B. Mitochondria
- C. Chloroplasts
- D. Ribosomes

Answer: C

7. During photosynthesis, plants synthesize sugars and starch from:

- A. Amino acids
- B. 

- C. Acetyl-CoA
- D. Fatty acids

Answer: B

8. Which molecules provide energy for carbohydrate synthesis during photosynthesis?

- A. ATP and NADPH
- B. ATP and FADH $\blacksquare$
- C. NADH and FADH $\blacksquare$
- D. ADP and NAD $\blacksquare$

Answer: A

9. An integrated network of enzyme-mediated chemical reactions is called:

- A. Secondary metabolism
- B. Intermediary metabolism
- C. Protein synthesis
- D. Photosynthesis

Answer: B

10. The pathways involved in intermediary metabolism are called:

- A. Biosynthetic units
- B. Metabolic pathways
- C. Secondary compounds
- D. Genetic pathways

Answer: B

11. Which of the following is a primary metabolite?

- A. Morphine
- B. Digoxin
- C. Glucose
- D. Alkaloid

Answer: C

12. Secondary metabolites are generally:

- A. Essential for basic growth
- B. Low molecular weight compounds
- C. Present identically in all organisms
- D. Required for protein synthesis

Answer: B

13. Secondary metabolites are mainly produced for:

- A. DNA replication
- B. Adaptation and specific functions
- C. ATP production only
- D. Cell division only

Answer: B

14. Which of the following is an example of a secondary metabolite?

- A. Glucose
- B. Amino acid
- C. Morphine
- D. Nucleotide

Answer: C

15. Digoxin is obtained from:

- A. Willow
- B. Foxglove
- C. Opium
- D. Penicillium

Answer: B

16. Morphine is obtained from:

- A. Digitalis lanata
- B. Salix spp.
- C. Papaver somniferum
- D. Penicillium spp.

Answer: C

17. Aspirin is associated with:

- A. Willow
- B. Foxglove
- C. Opium
- D. Cannabis

Answer: A

18. Penicillin is classified as a/an:

- A. Cardiotonic
- B. Antibiotic
- C. Alkaloid precursor
- D. Steroid

Answer: B

19. Anthocyanins are important because they:

- A. Produce ATP
- B. Color flowers and attract pollinators
- C. Form amino acids
- D. Produce fatty acids

Answer: B

20. Nicotine may protect plants from:

- A. Sunlight
- B. Herbivores and microbes
- C. Water loss only
- D. Photosynthesis

Answer: B

21. The final product of glycolysis is:

- A. Acetyl-CoA
- B. Pyruvic acid
- C. Shikimic acid
- D. Malonyl-CoA

Answer: B

22. Pyruvic acid contains:

- A. 2 carbons
- B. 3 carbons
- C. 4 carbons
- D. 6 carbons

Answer: B

23. Pyruvate can be further degraded to:

- A. Acetyl-CoA
- B. Shikimate
- C. Mevalonate
- D. Isoprene

Answer: A

24. Acetyl-CoA contains:

- A. 1 carbon
- B. 2 carbons
- C. 3 carbons
- D. 5 carbons

Answer: B

25. Acetyl-CoA is a backbone for many:

- A. Primary and secondary metabolites
- B. Nucleic acids only
- C. Proteins only
- D. Vitamins only

Answer: A

26. Shikimic acid is formed from:

- A. Acetyl-CoA + malonyl-CoA
- B. Pyruvate + glyceraldehyde-3-phosphate
- C. Phosphoenolpyruvate + erythrose-4-phosphate
- D. Three molecules of acetyl-CoA

Answer: C

27. Erythrose-4-phosphate is derived from the:

- A. Krebs cycle
- B. Pentose phosphate pathway
- C. β -oxidation pathway
- D. Mevalonate pathway

Answer: B

28. Which pathway releases energy from carbohydrates through oxidative reactions?

- A. Glycolysis and Krebs cycle
- B. Shikimate pathway only
- C. Mevalonate pathway only
- D. Acetate pathway only

Answer: A

29. β -oxidation is involved in the oxidation of:

- A. Amino acids
- B. Fatty acids

- C. Nucleotides
- D. Sugars

Answer: B

30. The Krebs cycle is also known as the:

- A. Pentose phosphate cycle
- B. Tricarboxylic acid cycle
- C. Shikimate cycle
- D. Mevalonate cycle

Answer: B

31. Acetyl-CoA can enter the tricarboxylic acid cycle to produce:

- A. Non-aromatic plant acids
- B. Alkaloids only
- C. Steroids only
- D. Aromatic amino acids

Answer: A

32. Which of the following is a product associated with the TCA cycle?

- A. Citric acid
- B. Morphine
- C. Squalene
- D. Isoprene

Answer: A

33. Acetyl-CoA + malonyl-CoA can initiate formation of:

- A. Fatty acids
- B. Aromatic amino acids
- C. Steroids directly
- D. Tryptophan

Answer: A

34. The mevalonic acid pathway produces:

- A. Terpenoids and steroids
- B. Aromatic amino acids
- C. Proteins
- D. Nucleic acids

Answer: A

35. The acetate-malonate pathway produces:

- A. Only proteins
- B. Aromatic, monocyclic and polycyclic compounds
- C. Only nucleic acids
- D. Only amino acids

Answer: B

36. Mevalonic acid is formed from:

- A. Two acetyl-CoA molecules
- B. Three acetyl-CoA molecules
- C. Four acetyl-CoA molecules
- D. One acetyl-CoA molecule

Answer: B

37. The deoxyxylulose phosphate pathway arises from:

- A. Pyruvic acid + glyceraldehyde-3-phosphate
- B. Acetyl-CoA + malonyl-CoA
- C. PEP + erythrose-4-phosphate
- D. Phenylalanine + tyrosine

Answer: A

38. The mevalonate pathway leads to:

- A. Isoprene units and steroids
- B. Aromatic amino acids only
- C. Proteins
- D. Nucleic acids

Answer: A

39. Squalene is associated with the formation of:

- A. Steroids
- B. Amino acids
- C. Phenols
- D. Fatty acids

Answer: A

40. The shikimate pathway produces:

- A. Aromatic amino acids
- B. Fatty acids only
- C. Steroids only
- D. Sugars only

Answer: A

41. Which amino acid is NOT one of the three aromatic amino acids produced through the shikimate pathway?

- A. Phenylalanine
- B. Tyrosine
- C. Tryptophan
- D. Lysine

Answer: D

42. The shikimate pathway can lead to the formation of:

- A. Phenols
- B. Lignans
- C. Alkaloids
- D. All of the above

Answer: D

43. Phenylalanine and tyrosine can provide the carbon skeleton for:

- A. C₆C₃ units
- B. C₄N units
- C. C₅N units
- D. C₂ units

Answer: A

44. Formation of the C6C3 unit from an amino acid requires loss of:

- A. Oxygen
- B. Amino group
- C. Carbonyl group
- D. Sulfur

Answer: B

45. The C6C3 side chain may be:

- A. Only saturated
- B. Only unsaturated
- C. Saturated or unsaturated and may be oxygenated
- D. Always nitrogen-containing

Answer: C

46. The C1 methyl building unit is supplied from:

- A. Methionine
- B. Lysine
- C. Ornithine
- D. Tryptophan

Answer: A

47. Methionine is converted into _____ to enhance its leaving group ability.

- A. MVA
- B. SAM
- C. ATP
- D. NADPH

Answer: B

48. SAM contains a positively charged:

- A. Oxygen
- B. Nitrogen
- C. Sulfur
- D. Carbon

Answer: C

49. Formation of SAM facilitates a nucleophilic substitution of:

- A. SN1 type
- B. SN2 type
- C. E1 type
- D. E2 type

Answer: B

50. SAM can produce:

- A. O-methyl and N-methyl linkages
- B. Only C-methyl linkages
- C. Only peptide bonds
- D. Glycosidic bonds only

Answer: A

51. A two-carbon building unit may be supplied by:

- A. Acetyl-CoA

- B. Methionine
- C. Ornithine
- D. Tryptophan

Answer: A

52. Acetyl-CoA is converted into _____ before incorporation in many aromatic systems.

- A. Pyruvate
- B. Malonyl-CoA
- C. Mevalonate
- D. Shikimate

Answer: B

53. The C₅ isoprene unit is characteristic of compounds formed from:

- A. Shikimate
- B. Mevalonate
- C. Ornithine
- D. Methionine

Answer: B

54. How many carbons of mevalonate are actually used in the isoprene unit?

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

Answer: C

55. The C₆C₂N unit can be formed from:

- A. Phenylalanine or tyrosine
- B. Lysine only
- C. Ornithine only
- D. Methionine only

Answer: A

56. In formation of the C₆C₂N unit, the _____ carbon is removed.

- A. α -carbon
- B. Carboxyl carbon
- C. Methyl carbon
- D. Carbonyl carbon

Answer: B

57. The indole-C₂N unit is derived from:

- A. Phenylalanine
- B. Tyrosine
- C. Tryptophan
- D. Lysine

Answer: C

58. The C₄N unit is usually found as a:

- A. Pyrrolidine system
- B. Piperidine system
- C. Benzene system

D. Steroid system

Answer: A

59. The C₄N unit is produced from:

A. L-lysine

B. L-ornithine

C. L-tryptophan

D. L-methionine

Answer: B

60. In formation of the C₄N unit, ornithine supplies its:

A. α -amino nitrogen

B. β -amino nitrogen

C. γ -amino nitrogen

D. δ -amino nitrogen

Answer: D

61. The C₅N unit is produced using:

A. L-lysine

B. L-ornithine

C. L-tyrosine

D. L-phenylalanine

Answer: A

62. The C₅N unit is associated with a:

A. Pyrrolidine system

B. Piperidine system

C. Benzene ring

D. Steroid nucleus

Answer: B

63. How many major pathways are involved in biosynthesis of different secondary metabolites according to the chapter?

A. Two

B. Three

C. Four

D. Five

Answer: B

64. Which is NOT one of the three major pathways?

A. Acetate–Malonate pathway

B. Acetate–Mevalonate pathway

C. Shikimic acid pathway

D. Urea cycle pathway

Answer: D

65. The acetate-malonate pathway is associated mainly with:

A. Fatty acids and polyketides

B. Steroids only

C. Aromatic amino acids only

D. Nucleic acids

Answer: A

66. The acetate-mevalonate pathway produces:

- A. Terpenes and steroids
- B. Proteins
- C. Aromatic amino acids
- D. Nucleotides

Answer: A

67. The shikimic acid pathway produces:

- A. Aromatic amino acids and phenylpropanoids
- B. Only fatty acids
- C. Only steroids
- D. Only sugars

Answer: A

68. The largest classes of plant secondary metabolites include:

- A. Alkaloids, terpenoids and phenolics
- B. Proteins, carbohydrates and lipids
- C. Nucleic acids, proteins and sugars
- D. Vitamins, minerals and proteins

Answer: A

69. Secondary compounds combined with sugars are called:

- A. Polyketides
- B. Glycosides
- C. Terpenes
- D. Alkaloids

Answer: B

70. A common sugar found in glycosides is:

- A. Glucose
- B. ATP
- C. Acetyl-CoA
- D. Shikimate

Answer: A

71. Apiose is a unique sugar associated with:

- A. Cannabis
- B. Parsley and its relatives
- C. Foxglove
- D. Willow

Answer: B

72. Which combination correctly represents the precursor of shikimic acid?

- A. Acetyl-CoA + malonyl-CoA
- B. PEP + erythrose-4-phosphate
- C. Pyruvate + acetyl-CoA
- D. Three acetyl-CoA molecules

Answer: B

73. Which combination correctly represents the precursor of deoxyxylulose phosphate?

- A. Pyruvate + glyceraldehyde-3-phosphate
- B. PEP + erythrose-4-phosphate
- C. Acetyl-CoA + malonyl-CoA
- D. Phenylalanine + tyrosine

Answer: A

74. Which precursor gives rise to the C5 isoprene unit?

- A. Methionine
- B. Mevalonate
- C. Ornithine
- D. Tryptophan

Answer: B

75. Which pathway is directly associated with terpenoids and steroids?

- A. Shikimate pathway
- B. Acetate-malonate pathway
- C. Mevalonate pathway
- D. Glycolysis

Answer: C

76. Which pathway is associated with aromatic amino acids?

- A. Shikimate pathway
- B. β -oxidation
- C. Mevalonate pathway
- D. Acetate-malonate pathway

Answer: A

77. Which amino acid is the precursor of the indole-C2N building block?

- A. Lysine
- B. Ornithine
- C. Tryptophan
- D. Methionine

Answer: C

78. Which amino acid provides the C5N building block?

- A. Lysine
- B. Ornithine
- C. Tyrosine
- D. Tryptophan

Answer: A

79. Which amino acid provides the C4N building block?

- A. Lysine
- B. Ornithine
- C. Phenylalanine
- D. Methionine

Answer: B

80. Which statement is CORRECT?

- A. Mevalonate is formed from two acetyl-CoA molecules
- B. Shikimate is formed from acetyl-CoA and malonyl-CoA

- C. Mevalonate is formed from three acetyl-CoA molecules
- D. C5 isoprene units are derived directly from methionine

Answer: C