

1. Which of the following is the first intermediate compound formed in the citric acid cycle?
- a) Citrate
 - b) Isocitrate
 - c) Oxaloacetate
 - d) Succinyl-CoA
 - e) Fumarate

Answer: a

2. The citric acid cycle takes place in which cellular organelle?
- a) Nucleus
 - b) Mitochondria
 - c) Endoplasmic reticulum
 - d) Golgi apparatus
 - e) Lysosome

Answer: b

3. How many NADH molecules are produced by one turn of the citric acid cycle?
- a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5

Answer: c

4. Which enzyme catalyzes the conversion of citrate to isocitrate in the citric acid cycle?
- a) Citrate synthase
 - b) Aconitase
 - c) Isocitrate dehydrogenase
 - d) Succinyl-CoA synthetase
 - e) Fumarase

Answer: b

5. Which of the following is the electron acceptor in the citric acid cycle?
- a) NAD^+
 - b) NADH
 - c) FAD
 - d) FADH_2
 - e) ATP

Answer: a, c

6. In the citric acid cycle, which compound is regenerated at the end of each turn of the cycle?
- a) Citrate
 - b) Isocitrate
 - c) Oxaloacetate
 - d) Succinate
 - e) Acetyl-CoA

Answer: c

7. Which enzyme is responsible for the conversion of succinyl-CoA to succinate in the citric acid cycle?
- a) Citrate synthase
 - b) Aconitase
 - c) Isocitrate dehydrogenase
 - d) Succinyl-CoA synthetase
 - e) Succinate dehydrogenase

Answer: d

8. How many CO₂ molecules are released in one turn of the citric acid cycle?
- a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5

Answer: b

9. Which of the following is the rate-limiting step of the citric acid cycle?
- a) Citrate synthase
 - b) Aconitase
 - c) Isocitrate dehydrogenase
 - d) α -Ketoglutarate dehydrogenase
 - e) Succinyl-CoA synthetase

Answer: a, c, d

10. Which enzyme converts α -ketoglutarate to succinyl-CoA in the citric acid cycle?
- a) Citrate synthase
 - b) Aconitase
 - c) Isocitrate dehydrogenase
 - d) α -Ketoglutarate dehydrogenase
 - e) Succinyl-CoA synthetase

Answer: d

11. Which coenzymes are involved in the citric acid cycle?
- a) NAD⁺ and NADH
 - b) NAD⁺ and FAD
 - c) FAD and FADH₂
 - d) ATP and ADP
 - e) GTP and GDP

Answer: b

12. How many ATP molecules are produced through substrate-level phosphorylation in one turn of the citric acid cycle?
- a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5

Answer: 1

13. Which enzyme catalyzes the conversion of malate to oxaloacetate in the citric acid cycle?

- a) Citrate synthase
- b) Aconitase
- c) Isocitrate dehydrogenase
- d) Malate dehydrogenase
- e) Fumarase

Answer: d

14. Which compound donates electrons to the electron transport chain in the citric acid cycle?

- a) NADH
- b) NAD⁺
- c) FADH₂
- d) FAD
- e) ATP

Answer: a, **c**

15. How many FADH₂ molecules are produced in one turn of the citric acid cycle?

- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

Answer: a

16. In the citric acid cycle, which enzyme catalyzes the conversion of fumarate to malate?

- a) Citrate synthase
- b) Aconitase
- c) Isocitrate dehydrogenase
- d) Fumarase
- e) Malate dehydrogenase

Answer: d

17. Which of the following enzymes in the citric acid cycle produces GTP?

- a) Citrate synthase
- b) Aconitase
- c) Isocitrate dehydrogenase
- d) α -Ketoglutarate dehydrogenase
- e) Succinyl-CoA synthetase

Answer: e

18. The citric acid cycle is also known as:

- a) Glycolysis
- b) Krebs cycle
- c) Calvin cycle

- d) Pentose phosphate pathway
- e) Urea cycle

Answer: b

19. How many carbon atoms are present in one molecule of acetyl-CoA?

- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

Answer: b

20. Which enzyme converts malate to oxaloacetate in the citric acid cycle?

- a) Citrate synthase
- b) Aconitase
- c) Isocitrate dehydrogenase
- d) Malate dehydrogenase
- e) Fumarase

Answer: d

21. The citric acid cycle is an aerobic process because it requires:

- a) Oxygen
- b) Carbon dioxide
- c) Glucose
- d) ATP
- e) Pyruvate

Answer: a

22. Which of the following is the committed step in the citric acid cycle?

- a) Citrate synthase
- b) Aconitase
- c) Isocitrate dehydrogenase
- d) α -Ketoglutarate dehydrogenase
- e) Succinyl-CoA synthetase

Answer: a, c, d

23. Which of the following compounds is not an intermediate of the citric acid cycle?

- a) Citrate
- b) Isocitrate
- c) Pyruvate
- d) α -Ketoglutarate
- e) Succinate

Answer: c

24. The citric acid cycle is an example of:

- a) Anabolic pathway
- b) Catabolic pathway
- c) Redox reaction

- d) Glycolytic pathway
 - e) Photosynthetic pathway
- Answer: a, b, c

25. Which enzyme catalyzes the conversion of α -ketoglutarate to succinyl-CoA in the citric acid cycle?
- a) Citrate synthase
 - b) Aconitase
 - c) Isocitrate dehydrogenase
 - d) α -Ketoglutarate dehydrogenase
 - e) Succinyl-CoA synthetase
- Answer: d

26. How many ATP molecules are generated by the complete oxidation of one molecule of glucose via the citric acid cycle?
- a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5
- Answer: b

27. Which of the following enzymes in the citric acid cycle produces GTP?
- a) Citrate synthase
 - b) Aconitase
 - c) Isocitrate dehydrogenase
 - d) α -Ketoglutarate dehydrogenase
 - e) Succinyl-CoA synthetase
- Answer: e

ETC

1. Where does the respiratory chain (electron transport chain) occur in eukaryotic cells?
- a) Nucleus
 - b) Cytoplasm
 - c) Golgi apparatus
 - d) Mitochondria
 - e) Endoplasmic reticulum
- Answer: d) Mitochondria
2. Which of the following is the final electron acceptor in the respiratory chain?
- a) NAD⁺
 - b) NADH
 - c) FAD
 - d) FADH₂
 - e) Oxygen (O₂)
- Answer: e) Oxygen (O₂)

3. What is the primary function of the respiratory chain?
- a) Synthesis of ATP
 - b) Synthesis of NADH
 - c) Synthesis of FADH₂
 - d) Synthesis of glucose
 - e) Production of oxygen
- Answer: a) Synthesis of ATP
4. Which complex of the respiratory chain transfers electrons from NADH to ubiquinone (coenzyme Q)?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: a) Complex I
5. Which complex of the respiratory chain transfers electrons from succinate to ubiquinone (coenzyme Q)?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: b) Complex II
6. How many electron transfer complexes are there in the respiratory chain?
- a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5
- Answer: d) 4
7. Which complex of the respiratory chain transfers electrons from ubiquinone (coenzyme Q) to cytochrome c?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: c) Complex III
8. Which complex of the respiratory chain contains cytochrome c oxidase?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: d) Complex IV
9. Which complex of the respiratory chain is also known as cytochrome c reductase?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV

e) Complex V

Answer: c) Complex III

10. Which complex of the respiratory chain is responsible for the final step of electron transfer to oxygen?

a) Complex I

b) Complex II

c) Complex III

d) Complex IV

e) Complex V

Answer: d) Complex IV

11. Which complex of the respiratory chain is also known as ATP synthase?

a) Complex I

b) Complex II

c) Complex III

d) Complex IV

e) Complex V

Answer: e) Complex V

12. How many protons are required for the synthesis of one molecule of ATP by ATP synthase?

a) 1

b) 2

c) 3

d) 4

e) 5

Answer: b) 2

13. Which protein complex of the respiratory chain is responsible for generating a proton gradient across the inner mitochondrial membrane?

a) Complex I

b) Complex II

c) Complex III

d) Complex IV

e) Complex V

Answer: e) Complex V

14. Which molecule transfers electrons from Complex I or Complex II to Complex III in the respiratory chain?

a) NADH

b) FADH₂

c) Cytochrome c

d) ATP

e) Ubiquinone (coenzyme Q)

Answer: e) Ubiquinone (coenzyme Q)

15. Which of the following molecules is an inhibitor of the respiratory chain at Complex IV?

a) Rotenone

b) Antimycin A

c) Azide

d) Cyanide

e) Carbon monoxide (CO)

Answer: d) Cyanide, e) Carbon monoxide (CO)

21. Which complex of the respiratory chain is composed of multiple protein subunits and contains flavin mononucleotide (FMN) as a prosthetic group?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: a) Complex I
22. Which molecule acts as an intermediate electron carrier between Complex I and Complex III in the respiratory chain?
- a) NADH
 - b) FADH₂
 - c) Cytochrome c
 - d) ATP
 - e) Ubiquinone (coenzyme Q)
- Answer: e) Ubiquinone (coenzyme Q)
23. Which complex of the respiratory chain is also known as succinate dehydrogenase?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: b) Complex II
24. Which molecule donates electrons directly to Complex II in the respiratory chain?
- a) NADH
 - b) FADH₂
 - c) Cytochrome c
 - d) ATP
 - e) Succinate
- Answer: e) Succinate
25. Which complex of the respiratory chain is responsible for transferring electrons from cytochrome c to oxygen?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: d) Complex IV
26. Which complex of the respiratory chain is responsible for the synthesis of ATP?
- a) Complex I
 - b) Complex II
 - c) Complex III
 - d) Complex IV
 - e) Complex V
- Answer: e) Complex V
27. Which molecule inhibits Complex I in the respiratory chain and is commonly used as a pesticide?

- a) Rotenone
- b) Antimycin A
- c) Azide
- d) Cyanide
- e) Carbon monoxide (CO)

Answer: a) Rotenone

28. Which molecule inhibits Complex III in the respiratory chain and is commonly used as an antibiotic?

- a) Rotenone
- b) Antimycin A
- c) Azide
- d) Cyanide
- e) Carbon monoxide (CO)

Answer: b) Antimycin A

29. Which molecule inhibits Complex IV in the respiratory chain and is commonly used in anesthesia?

- a) Rotenone
- b) Antimycin A
- c) Azide
- d) Cyanide
- e) Carbon monoxide (CO)

Answer: d) Cyanide

31. Which complex of the respiratory chain is responsible for the transfer of electrons from ubiquinol (reduced coenzyme Q) to cytochrome c?

- a) Complex I
- b) Complex II
- c) Complex III
- d) Complex IV
- e) Complex V

Answer: c) Complex III

32. Which complex of the respiratory chain contains iron-sulfur clusters as electron carriers?

- a) Complex I
- b) Complex II
- c) Complex III
- d) Complex IV
- e) Complex V

Answer: a) Complex I

33. Which complex of the respiratory chain uses copper ions (CuA and CuB) as cofactors?

- a) Complex I
- b) Complex II
- c) Complex III
- d) Complex IV
- e) Complex V

Answer: d) Complex IV

34. Which molecule acts as an electron carrier between Complex III and Complex IV in the respiratory chain?

- a) NADH

- b) FADH₂
- c) Cytochrome c
- d) ATP
- e) Ubiquinone (coenzyme Q)

Answer: c) Cytochrome c

35. Which complex of the respiratory chain catalyzes the reduction of molecular oxygen to water?

- a) Complex I
- b) Complex II
- c) Complex III
- d) Complex IV
- e) Complex V

Answer: d) Complex IV

36. Which molecule inhibits Complex IV in the respiratory chain and is commonly used as a preservative in food and beverages?

- a) Rotenone
- b) Antimycin A
- c) Azide
- d) Cyanide
- e) Carbon monoxide (CO)

Answer: e) Carbon monoxide (CO)