

Respiration in Plants — NEET Biology PYQ (2005-2021)

Class 11 Biology · 22 real NEET & AIPMT questions, year-tagged · answers checked by RankUp

NEET 2021

1. Which of the following statements is incorrect ?

- (A) During aerobic respiration, role of oxygen is limited to the terminal stage.
- (B) In ETC (Electron Transport Chain), one molecule of $\text{NADH} + \text{H}^+$ gives rise to 2 ATP molecules, and one FADH_2 gives rise to 3 ATP molecules.
- (C) ATP is synthesized through complex V.
- (D) Oxidation-reduction reactions produce proton gradient in respiration.

NEET 2020 · Q85

2. The number of substrate level phosphorylations in one turn of citric acid cycle is:

- (A) Zero
- (B) One
- (C) Two
- (D) Three

NEET 2019 · Q95

3. Respiratory Quotient (RQ) value of tripalmitin is :

- (A) 0.9
- (B) 0.7
- (C) 0.07
- (D) 0.09

NEET 2019 · Q148

4. Conversion of glucose to glucose-6-phosphate, the first irreversible reaction of glycolysis, is catalyzed by :

- (A) Aldolase
- (B) Hexokinase
- (C) Enolase
- (D) Phosphofructokinase

NEET 2018 · Q96

5. What is the role of NAD^+ in cellular respiration?

- (A) It is a nucleotide source for ATP synthesis.
- (B) It functions as an electron carrier.
- (C) It functions as an enzyme.
- (D) It is the final electron acceptor for anaerobic respiration.

NEET 2018 · Q170

6. Which of these statements is incorrect?

- (A) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.
- (B) Glycolysis occurs in cytosol.
- (C) Enzymes of TCA cycle are present in mitochondrial matrix.
- (D) Oxidative phosphorylation takes place in outer mitochondrial membrane.

NEET 2017 · Q68

7. Which statement is wrong for Krebs' cycle?

- (A) There are three points in the cycle where NAD^+ is reduced to $\text{NADH} + \text{H}^+$
- (B) There is one point in the cycle where FAD^+ is reduced to FADH_2
- (C) During conversion of succinyl CoA to succinic acid, a molecule of GTP is synthesised
- (D) The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid

NEET 2017 (Gujarati paper) · Q65

8. Which of the following values will depict correct respiratory quotient when tripalmitin (a fatty acid) is used as a respiratory substrate?

- (A) 1
- (B) 0.7
- (C) 0.9
- (D) 1.1

NEET 2016 Phase 2 · Q108

9. Which of the following biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins?

- (A) Glucose-6-phosphate
- (B) Fructose 1,6-bisphosphate
- (C) Pyruvic acid
- (D) Acetyl CoA

NEET 2016 Phase 2 · Q142

10. Oxidative phosphorylation is

- (A) formation of ATP by transfer of phosphate group from a substrate to ADP
- (B) oxidation of phosphate group in ATP
- (C) addition of phosphate group to ATP
- (D) formation of ATP by energy released from electrons removed during substrate oxidation

AIPMT 2015

11. Cytochromes are found in:

- (A) Lysosomes
- (B) Matrix of mitochondria
- (C) Outer wall of mitochondria
- (D) Cristae of mitochondria

AIPMT 2014

12. In which one of the following processes CO₂ is not released?

- (A) Aerobic respiration in animals
- (B) Alcoholic fermentation
- (C) Lactate fermentation
- (D) Aerobic respiration in plants

AIPMT 2011 Mains

13. In mitochondria, protons accumulate in the

- (A) Intermembrane space
- (B) Matrix
- (C) Outer membrane
- (D) Inner membrane

AIPMT 2010 Prelims · Q142

14. The energy releasing metabolic process in which substrate is oxidised without an external electron acceptor is called

- (A) Photorespiration
- (B) Glycolysis
- (C) Fermentation
- (D) Aerobic respiration

AIPMT 2009 Prelims · Q102

15. Aerobic respiratory pathway is appropriately termed:

- (A) Parabolic
- (B) Amphibolic
- (C) Anabolic
- (D) Catabolic

16. The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that adenosine triphosphate (ATP) is formed because

- (A) There is a change in the permeability of the inner mitochondrial membrane toward adenosine diphosphate (ADP)
- (B) High energy bonds are formed in mitochondrial proteins
- (C) ADP is pumped out of the matrix into the intermembrane space
- (D) A proton gradient forms across the inner membrane

17. The energy releasing process in which the substrate is oxidised without an external electron acceptor is called

- (A) Glycolysis
- (B) Fermentation
- (C) Photorespiration
- (D) Aerobic respiration

18. All enzymes of TCA cycle are located in the mitochondrial matrix except one which is located in inner mitochondrial membranes in eukaryotes and in cytosol in prokaryotes. This enzyme is

- (A) isocitrate dehydrogenase
- (B) malate dehydrogenase
- (C) succinate dehydrogenase
- (D) lactate dehydrogenase

19. The overall goal of glycolysis, Krebs cycle and the electron transport system is the formation of

- (A) ATP in one large oxidation reaction
- (B) sugars
- (C) nucleic acids
- (D) ATP in small stepwise units

20. Which one of the following mammalian cells is not capable of metabolising glucose to carbon dioxide aerobically?

- (A) unstriated muscle cells
- (B) liver cells
- (C) red blood cells
- (D) white blood cells

21. How many ATP molecules could maximally be generated from one molecule of glucose, if the complete oxidation of one mole of glucose to CO_2 and H_2O yields 686 kcal and the useful chemical energy available in the high energy phosphate bond of one mole of ATP is 12 kcal ?

- (A) Two
- (B) Thirty
- (C) Fifty seven
- (D) One

22. During which stage in the complete oxidation of glucose are the greatest number of ATP molecules formed from ADP ?

- (A) Conversion of pyruvic acid to acetyl Co-A
- (B) Electron transport chain
- (C) Glycolysis
- (D) Krebs cycle

Answer key and explanations

1. Answer: (B) In ETC (Electron Transport Chain), one molecule of NADH + H⁺ gives rise to 2 ATP molecules, and one FADH₂ gives rise to 3 ATP molecules.

In the electron transport chain one NADH + H⁺ yields 3 ATP and one FADH₂ yields 2 ATP, so the statement has the numbers swapped and is incorrect. Oxygen acts only at the end as the final electron acceptor, and ATP is made by complex V (ATP synthase) using the proton gradient.

2. Answer: (B) One

In one turn of the Krebs cycle only one substrate-level phosphorylation occurs: succinyl-CoA is converted to succinic acid with formation of one GTP (or ATP). The other ATP comes from oxidative phosphorylation of NADH and FADH₂, so zero, two or three are wrong.

3. Answer: (B) 0.7

$2 \text{C}_{51}\text{H}_{98}\text{O}_6 + 145 \text{O}_2 \rightarrow 102 \text{CO}_2 + 98 \text{H}_2\text{O} + \text{energy}$, so $\text{RQ} = 102/145 \approx 0.7$. RQ values for fats are below 1 because fats need more oxygen for oxidation; values like 0.07 are off by a factor of ten.

4. Answer: (B) Hexokinase

Hexokinase phosphorylates glucose to glucose-6-phosphate using ATP. Phosphofructokinase catalyses the later phosphorylation of fructose-6-phosphate to fructose-1,6-bisphosphate.

5. Answer: (B) It functions as an electron carrier.

NAD⁺ is a coenzyme that accepts electrons and hydrogen during glycolysis and the Krebs cycle, becoming NADH, and hands them to the electron transport chain. It is not an enzyme itself, and it is not a final electron acceptor; NADH is reoxidised during fermentation but the final acceptor there is an organic molecule such as pyruvate or acetaldehyde.

6. Answer: (D) Oxidative phosphorylation takes place in outer mitochondrial membrane.

Oxidative phosphorylation is carried out by the electron transport chain and ATP synthase located in the inner mitochondrial membrane, not the outer membrane. The other statements are correct: glycolysis is cytosolic and needs a supply of NAD⁺, and TCA enzymes lie in the matrix (succinate dehydrogenase being bound to the inner membrane).

7. Answer: (D) The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid

The Krebs cycle begins when acetyl CoA condenses with oxaloacetic acid and water to form citric acid, not with pyruvic acid; pyruvate is converted to acetyl CoA before the cycle. The cycle does have three NAD⁺ reductions, one FAD reduction and substrate-level GTP formation from succinyl CoA.

8. Answer: (B) 0.7

For tripalmitin, $2\text{C}_{51}\text{H}_{98}\text{O}_6 + 145 \text{O}_2 \rightarrow 102 \text{CO}_2 + 98 \text{H}_2\text{O}$, so $\text{RQ} = 102/145 \approx 0.7$. Fats are poor in oxygen and need more O₂ than the CO₂ they release; an RQ of 1 applies to carbohydrates.

9. Answer: (D) Acetyl CoA

Fatty acids are broken down by beta-oxidation to acetyl CoA, glucose gives pyruvate which becomes acetyl CoA, and many amino acids also enter as acetyl CoA, so it is the common entry point into the Krebs cycle. Pyruvic acid is not formed from fatty acids, and the sugar phosphates belong only to glycolysis.

10. Answer: (D) formation of ATP by energy released from electrons removed during substrate oxidation

In oxidative phosphorylation electrons removed from substrates (as NADH and FADH₂) pass along the electron transport chain, and the energy released drives ATP synthase to make ATP from ADP and Pi. Direct transfer of a phosphate from a substrate to ADP is substrate-level phosphorylation.

11. Answer: (D) Cristae of mitochondria

Cytochromes are electron carriers of the electron transport chain, which lies in the inner mitochondrial membrane, folded into cristae. The matrix holds the Krebs cycle enzymes, not the cytochromes.

12. Answer: (C) Lactate fermentation

In lactic acid fermentation pyruvate is reduced directly to lactate by NADH, with no decarboxylation step, so no CO₂ is given off. Alcoholic fermentation releases CO₂ when pyruvate is decarboxylated to acetaldehyde, and aerobic respiration in both plants and animals releases CO₂ in the link reaction and the Krebs cycle.

13. Answer: (A) Intermembrane space

During electron transport, complexes in the inner membrane pump protons from the matrix into the intermembrane space, where they build up; their return through ATP synthase drives ATP formation. Protons are pumped out of the matrix, so they do not accumulate there.

14. Answer: (C) Fermentation

In fermentation, NADH from glycolysis is reoxidised by reducing an internal organic molecule (pyruvate or acetaldehyde), so no external electron acceptor such as O_2 is needed. Aerobic respiration uses O_2 as the final external acceptor. Glycolysis is only one stage and needs NAD^+ to be regenerated.

15. Answer: (B) Amphibolic

NCERT calls the respiratory pathway amphibolic because it breaks down substrates (catabolism) and also supplies intermediates for synthesis of fatty acids, amino acids etc. (anabolism). Calling it only catabolic misses this dual role.

16. Answer: (D) A proton gradient forms across the inner membrane

According to the chemiosmotic hypothesis, the electron transport chain pumps protons into the intermembrane space, building a proton gradient across the inner mitochondrial membrane. Protons flowing back through F_0-F_1 ATP synthase drive ATP formation; high-energy protein intermediates were part of an older, rejected hypothesis.

17. Answer: (B) Fermentation

In fermentation the NADH produced during glycolysis is reoxidised by passing electrons to an organic product of the substrate itself (pyruvate or acetaldehyde), so no external acceptor such as O_2 is needed. Aerobic respiration depends on oxygen as the terminal external acceptor.

18. Answer: (C) succinate dehydrogenase

Succinate dehydrogenase is bound to the inner mitochondrial membrane, where it also forms complex II of the electron transport chain. Lactate dehydrogenase is not a Krebs cycle enzyme at all, and the other dehydrogenases are in the matrix.

19. Answer: (D) ATP in small stepwise units

Respiration oxidises glucose in many small enzyme-controlled steps so that the released energy can be trapped as ATP gradually rather than lost as heat in one burst. These pathways break sugars down; they do not make sugars or nucleic acids.

20. Answer: (C) red blood cells

Mature mammalian red blood cells lack mitochondria, so they cannot run the Krebs cycle and electron transport and depend on glycolysis to lactate. Liver, muscle and white blood cells have mitochondria and respire aerobically.

21. Answer: (C) Fifty seven

If all 686 kcal could be stored in ATP at 12 kcal per ATP, the maximum would be $686 / 12 \approx 57$ ATP. Thirty is close to the real yield from respiration, but the question asks for the theoretical maximum from the numbers given.

22. Answer: (B) Electron transport chain

Most of the ATP from aerobic respiration (about 34 of 38 in the older count) is made by oxidative phosphorylation as NADH and $FADH_2$ pass electrons down the electron transport chain. Glycolysis and the Krebs cycle make only a few ATP directly, by substrate-level phosphorylation.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.