

Cellular respiration

Name _____

Date _____

Period _____

Part 1 · Vocabulary

1. Write the letter of the matching description next to each term.

- | | |
|--------------------------------|---|
| _____ Glycolysis | A Folds of the inner membrane that add surface area |
| _____ Citric acid cycle | B Carrier that brings electrons to the electron transport chain |
| _____ NADH | C Cycle in the mitochondrial matrix that releases CO ₂ and makes NADH and FADH ₂ |
| _____ Electron transport chain | D The final electron acceptor; it forms water |
| _____ Oxygen | E The space inside the inner membrane, where the citric acid cycle happens |
| _____ Chemiosmosis | F Splits one glucose into two pyruvate molecules, in the cytoplasm |
| _____ ATP synthase | G Proteins in the inner mitochondrial membrane that pass electrons along and pump protons |
| _____ Cristae | H Regenerates NAD ⁺ so glycolysis can continue without oxygen |
| _____ Matrix | I Membrane enzyme whose rotor, turned by protons, makes ATP |
| _____ Fermentation | J Protons flowing back across the membrane drive the formation of ATP |

Part 2 · The stages

2. Write the overall equation for the cellular respiration of glucose.

3. Where in a eukaryotic cell does each stage happen: glycolysis, the citric acid cycle, the electron transport chain?

4. Glycolysis uses 2 ATP and makes 4 ATP. What is its net gain of ATP per glucose?

- | | |
|------------|------------------------------------|
| A 2 | C 6 |
| B 4 | D Zero — it only makes NADH |

5. Each turn of the citric acid cycle releases 2 CO₂. How many CO₂ does the cycle release for one glucose?

- | | |
|------------|------------|
| A 2 | C 6 |
| B 4 | D 1 |

6. Complete the table for one glucose.

	CO ₂ released	NADH made	FADH ₂ made	ATP (net)
Glycolysis				
Pyruvate → acetyl CoA (×2)				
Citric acid cycle (2 turns)				

Part 3 · The electron transport chain and ATP synthase

7. What is the final electron acceptor at the end of the electron transport chain?

- A NAD⁺
- B Oxygen
- C Cytochrome c
- D Carbon dioxide

8. Electrons from FADH₂ enter the chain at complex II. Why do they lead to fewer protons being pumped than electrons from NADH?

9. The chain has pumped protons out of the matrix. Where is the pH now higher?

- A In the matrix
- B In the intermembrane space
- C It is the same on both sides
- D In the cytoplasm only

10. Explain how the proton gradient across the inner membrane is used to make ATP.

11. Protons turn ATP synthase's rotor. How many ATP does one full 360° turn make?

- A 1
- B 3
- C 8
- D About 30

12. One full turn of human ATP synthase moves 8 protons and makes 3 ATP. About how many protons does each ATP take?

13. About what share of the ATP from aerobic breakdown of glucose comes from chemiosmosis?

Part 4 · Without oxygen

14. Without oxygen, why do muscle cells and yeast ferment?

- | | |
|---|---|
| A To make more ATP than aerobic respiration | C To make oxygen |
| B To turn NADH back into NAD ⁺ so glycolysis can keep going | D To keep the electron transport chain running |

15. Name the product of fermentation in (a) human muscle cells short of oxygen and (b) yeast.

16. Without oxygen, how many ATP does a cell get from one glucose?
