



Attempt questions first; check the separate key afterward. Use labelled diagrams where asked. Give scientific reasons; answer key covers closed questions.

A. Very short answers - 1 mark each

1. Where does glycolysis occur?
2. What is the end product of glycolysis per glucose?
3. What is net ATP gain in glycolysis per glucose?
4. Name the final electron acceptor in aerobic respiration.
5. Where does the TCA cycle mainly occur in eukaryotes?
6. Name the first stable product formed when acetyl-CoA joins oxaloacetate.
7. Define respiratory quotient.
8. What is RQ for complete aerobic oxidation of glucose?

B. Short answers / practice - 2 marks each

9. Why do plants not need specialised breathing organs like lungs?
10. Distinguish breathing from cellular respiration.
11. Outline the major stages of glycolysis.
12. Differentiate substrate-level and oxidative phosphorylation.
13. Explain oxidative decarboxylation of pyruvate.
14. State the products of pyruvate oxidation per glucose.
15. Trace one turn of the TCA cycle with its major products.
16. How many CO_2 molecules are released in two TCA turns?
17. How many NADH molecules form in one TCA turn?
18. Compare alcoholic and lactic-acid fermentation.
19. Why must NADH be reoxidised for glycolysis to continue?
20. State the net ATP gain in fermentation per glucose.

C. Application / reasoning - 3 marks each

21. How many pyruvate molecules form from five glucose molecules?
22. Find net glycolytic ATP from five glucose molecules.
23. Explain electron transfer through the respiratory chain.
24. Describe the role of proton pumping in ATP formation.
25. Why do actual cellular ATP yields differ from ideal textbook balance sheets?
26. Calculate RQ if 8 mL CO_2 is released and 10 mL O_2 consumed.
27. Why is fat oxidation generally associated with RQ below one?
28. Explain why respiration is an amphibolic pathway.
29. Describe where fats and proteins can enter respiratory metabolism.
30. Can glycolysis operate without oxygen?
31. Why is fermentation less efficient than complete aerobic oxidation?

D. Extended practice - 5 marks each

32. Draw and explain glycolysis, showing ATP investment and gain.
33. Describe the TCA cycle and its connection with electron transport.
34. Explain oxidative phosphorylation using a labelled mitochondrial membrane diagram.
35. Compare aerobic respiration and fermentation, and discuss RQ for different substrates.

ANSWER KEY - Numerical / closed questions

- 1) Cytoplasm. 2) Two pyruvate molecules. 3) Two ATP. 4) Oxygen. 5) Mitochondrial matrix. 6) Citrate. 7) CO_2 released/ O_2 consumed. 8) One. 14) Two acetyl-CoA, two NADH, two CO_2 . 16) Four. 17) Three. 20) Two ATP. 21) Ten. 22) Ten ATP. 26) 0.8. 30) Yes.