# What is Anaerobic Respiration?

Worksheet

Anaerobic respiration is the breakdown of glucose without oxygen; glycolysis yields a net 2 ATP, and pyruvate is converted to lactic acid or ethanol to regenerate the NAD+ that glycolysis needs to keep running.

## Questions

1. What is the net ATP yield from glycolysis alone (before fermentation)?

A) 2 ATP
B) 4 ATP
C) 36 ATP
D) 0 ATP

2. Which fermentation pathway produces ethanol and CO2?

A) Lactic acid fermentation
B) Alcohol fermentation
C) Aerobic respiration
D) Chemiosmosis

3. Why does anaerobic respiration produce far less ATP than aerobic respiration?

A) It skips the Krebs cycle and electron transport chain
B) It uses a different type of glucose
C) It only occurs in plants
D) It requires more oxygen

4. What causes the burning feeling in muscles during intense exercise?

A) Excess oxygen
B) Buildup of lactic acid from fermentation
C) Excess glucose
D) CO2 buildup

5. A muscle cell ferments 5 molecules of glucose anaerobically during a sprint. How much net ATP is produced?

6. A yeast culture ferments 3 molecules of glucose via alcohol fermentation. How many CO2 molecules are released?

7. During a 60-second all-out sprint, a runner's leg muscles ferment about 12 glucose molecules due to oxygen debt. Calculate the net ATP produced.

8. Define: What is fermentation?

9. Define: Lactic acid vs alcohol fermentation?

10. Define: Net ATP per glucose in fermentation?

# Answer Key

1. A) 2 ATP - Glycolysis produces 4 ATP but consumes 2, for a net gain of 2 ATP per glucose.

2. B) Alcohol fermentation - Yeast and some plant cells convert pyruvate to acetaldehyde, then ethanol, releasing CO2.

3. A) It skips the Krebs cycle and electron transport chain - Fermentation only regenerates NAD+ so glycolysis can continue - it doesn't extract the extra energy the Krebs cycle and electron transport chain provide.

4. B) Buildup of lactic acid from fermentation - When oxygen is scarce, muscle cells ferment pyruvate into lactic acid, which lowers pH and causes fatigue/burning.

5. Net ATP = 2 number of glucose molecules Net ATP = 2 5 = 10 ATP Also produces 10 molecules of lactic acid

6. Alcohol fermentation releases 2 CO2 per glucose fermented CO2 released = 2 3 = 6 molecules Also produces 6 ethanol molecules and 6 net ATP (2 3)

7. Net ATP = 2 number of glucose molecules Net ATP = 2 12 = 24 ATP This is far less than the ~36 ATP per glucose available with oxygen, so the muscle fatigues quickly

8. The anaerobic breakdown of glucose that regenerates NAD+ so glycolysis can continue, yielding a net 2 ATP per glucose.

9. Lactic acid fermentation (muscle cells, some bacteria) makes lactic acid; alcohol fermentation (yeast, plants) makes ethanol + CO2.

10. 2 ATP - all from glycolysis; no additional ATP is made during the fermentation step itself.