

# What are Metabolic Pathways?

## Worksheet

A metabolic pathway is an ordered sequence of enzyme-catalyzed reactions that converts a starting molecule into a final product, either breaking down molecules for energy (catabolic) or building them up (anabolic).

## Questions

1. What best defines a metabolic pathway?

- A) A single isolated chemical reaction
- B) A series of connected enzyme-catalyzed reactions
- C) A type of cell membrane transport
- D) A random collection of unrelated reactions

2. Which pathway type releases energy by breaking down molecules?

- A) Anabolic
- B) Catabolic
- C) Genomic
- D) Photic

3. Which of the following is an anabolic pathway?

- A) Glycolysis
- B) Cellular respiration
- C) Protein synthesis
- D) Beta-oxidation of fats

4. What is feedback inhibition in a metabolic pathway?

- A) The first enzyme activates the last step
- B) The end product inhibits an earlier enzyme to regulate the pathway
- C) Enzymes work faster as temperature rises indefinitely
- D) Pathways run in reverse randomly

5. In cellular respiration, one glucose molecule is broken down through glycolysis, the Krebs cycle, and oxidative phosphorylation to yield about 30-32 ATP. Is this pathway catabolic or anabolic?

6. Protein synthesis links individual amino acids together, using energy from ATP/GTP, to build a polypeptide chain of 300 amino acids. Is this catabolic or anabolic?

7. A metabolic pathway has 6 sequential enzyme-catalyzed steps, each controlled by a different enzyme (E1-E6). If enzyme E3 is inhibited, what happens to the pathway?

8. Define: What is a metabolic pathway?

9. Define: What is a catabolic pathway?

10. Define: What is an anabolic pathway?

## Answer Key

1. B) A series of connected enzyme-catalyzed reactions - A pathway is a sequence where each step's product feeds into the next.
2. B) Catabolic - Catabolic pathways break down complex molecules and release energy, like cellular respiration.
3. C) Protein synthesis - Protein synthesis builds complex molecules from amino acids, consuming energy-an anabolic process.
4. B) The end product inhibits an earlier enzyme to regulate the pathway - Feedback inhibition is a regulatory mechanism where accumulated end product slows an earlier step.
5. The pathway breaks a complex molecule (glucose) into simpler products (CO<sub>2</sub> and H<sub>2</sub>O) Energy is released and captured as ATP (30-32 molecules) Breaking down + releasing energy = catabolic pathway
6. Simple building blocks (amino acids) are combined into a complex molecule (protein) Energy is consumed (each peptide bond formation costs ATP/GTP equivalents) Building up + consuming energy = anabolic pathway
7. Steps 1 and 2 (controlled by E1, E2) can still proceed normally Step 3 (controlled by E3) is blocked, so no product for step 3 is made Steps 4, 5, 6 cannot proceed because they depend on step 3's product Result: the pathway stalls at step 3, and intermediate 2 accumulates
8. A series of connected, enzyme-catalyzed reactions where each reaction's product becomes the next reaction's substrate.
9. A pathway that breaks down complex molecules into simpler ones, releasing energy (e.g., cellular respiration).
10. A pathway that builds complex molecules from simpler ones, consuming energy (e.g., protein synthesis).

### **Bounlu**

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