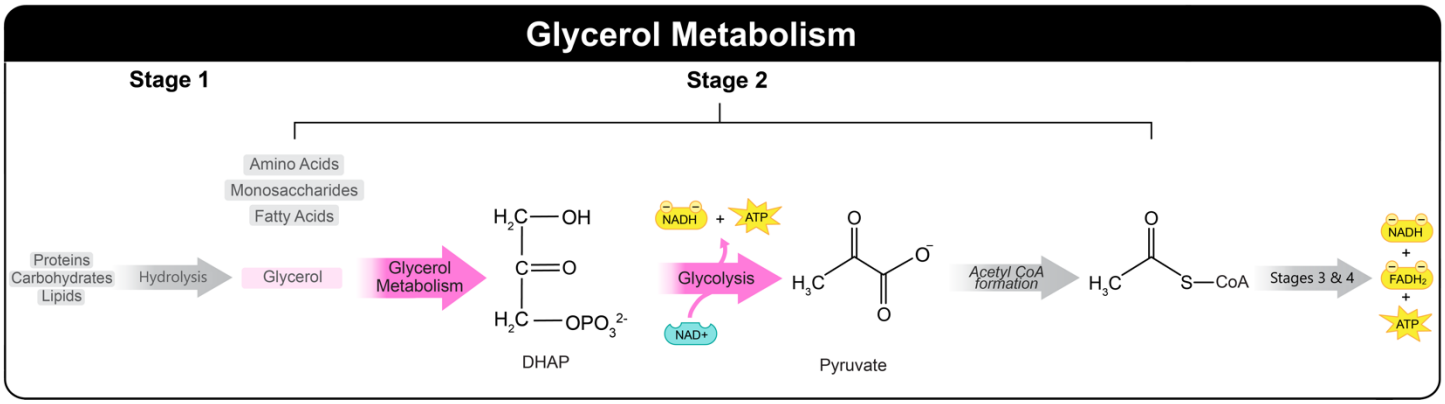
CONCEPT: CATABOLISM OF FATS: GLYCEROL METABOLISM

● The main purpose of glycerol metabolism is ATP production through _____.

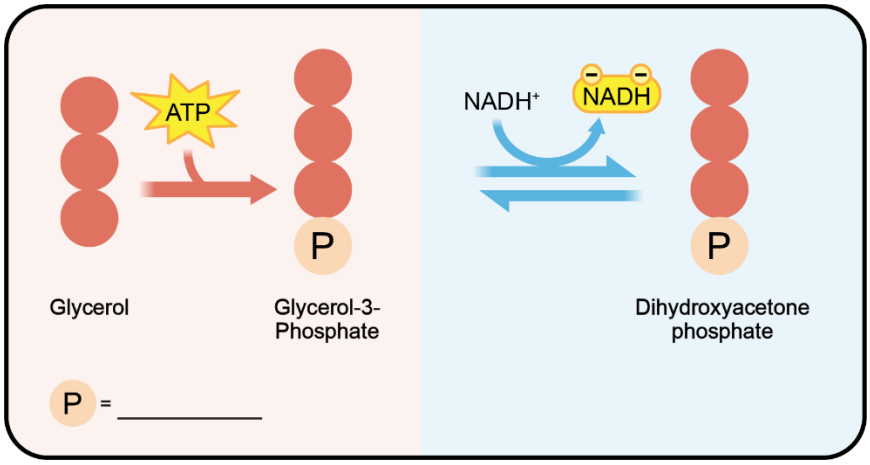


Stages of Glycerol Metabolism

● Glycerol metabolism begins with the hydrolysis of the triacylglycerol (TAG) molecule into _____ and ___ fatty acids.

□ The newly released _____ then travels to the liver to undergo ___ biochemical reactions.

- Reaction 1 is _____ and consumes ___ ATP for energy.
- Reaction 2 results in dihydroxyacetone phosphate (DHAP).



EXAMPLE: Which of the following statements about glycerol metabolism is true?

a) Doesn't involve a phosphorylation step.

b) The first step is energy-producing in nature.

c) A source of glycerol is from the triacylglycerol molecule that must first undergo hydrolysis.

d) The second step is energy-consuming in nature.

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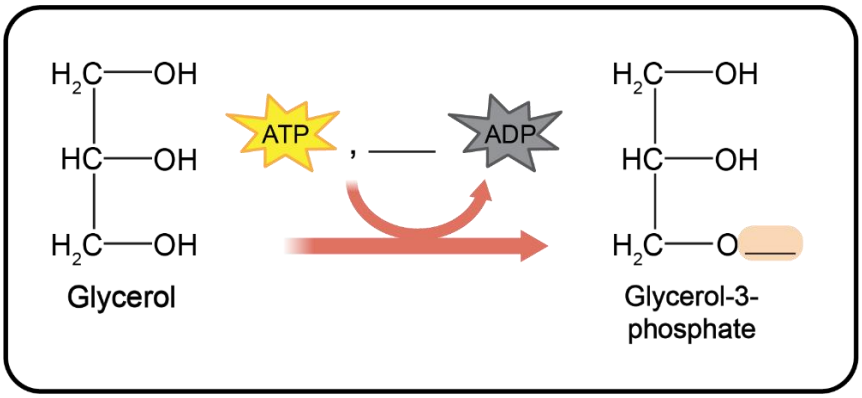
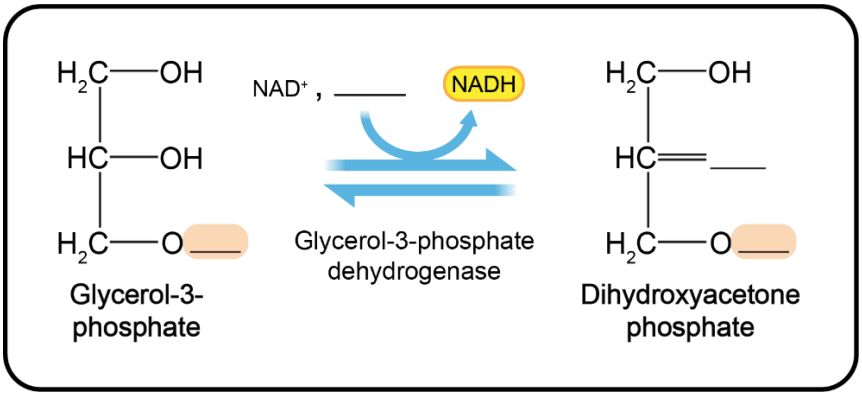
1 Phosphorylation: the enzyme glycerol _____ catalyzes the phosphorylation of glycerol.

□ Uses ATP as a source of energy and _____ phosphate (OPO_3^{2-}).



2 Oxidation: the _____ enzyme oxidizes glycerol-3-phosphate to dihydroxyacetone phosphate (DHAP).

□ 1 NAD^+ is reduced to 1 _____.



- **Recall:** DHAP can then directly enter Reaction ____ of glycolysis.

EXAMPLE: Which of the following statements is true in regard to glycerol metabolism?

a) The first step involves the use of a kinase that phosphorylates a secondary alcohol group.

b) NAD^+ represents a high energy molecule produced during step 2.

c) An isomerase enzyme could also be used for the conversion of glycerol-3-phosphate to DHAP.

d) The ATP molecule serve as a phosphate source to phosphorylate a primary alcohol group.

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PRACTICE: Which of the following outlines the overall pathway of glycerol metabolism?

a) (1) Phosphorylation (2) Decarboxylation (3) Reduction

b) (1) Cleavage of a triacylglycerol (2) Phosphorylation (3) Oxidation

c) (1) Carboxylation (2) Phosphorylation (3) Decarboxylation

d) (1) Oxidation & Decarboxylation (2) Isomerization (3) Cleavage of a triacylglycerol (4) Hydration

PRACTICE: Which of the following represents the complete chemical reaction for the two stages of glycerol metabolism?

a) Glycerol + NAD^+ + ADP $\longrightarrow$ Glycerol-3-phosphate + NADH + ATP

b) Glycerol + NAD^+ + ATP $\longrightarrow$ DHAP + NADH + H^+ + ADP

c) Glycerol-3-phosphate + NADH + H^+ $\longrightarrow$ Glycerol + ADP + P_i

d) Fatty acid + NaOH + H_2O $\longrightarrow$ Glycerol + NADH + H_2