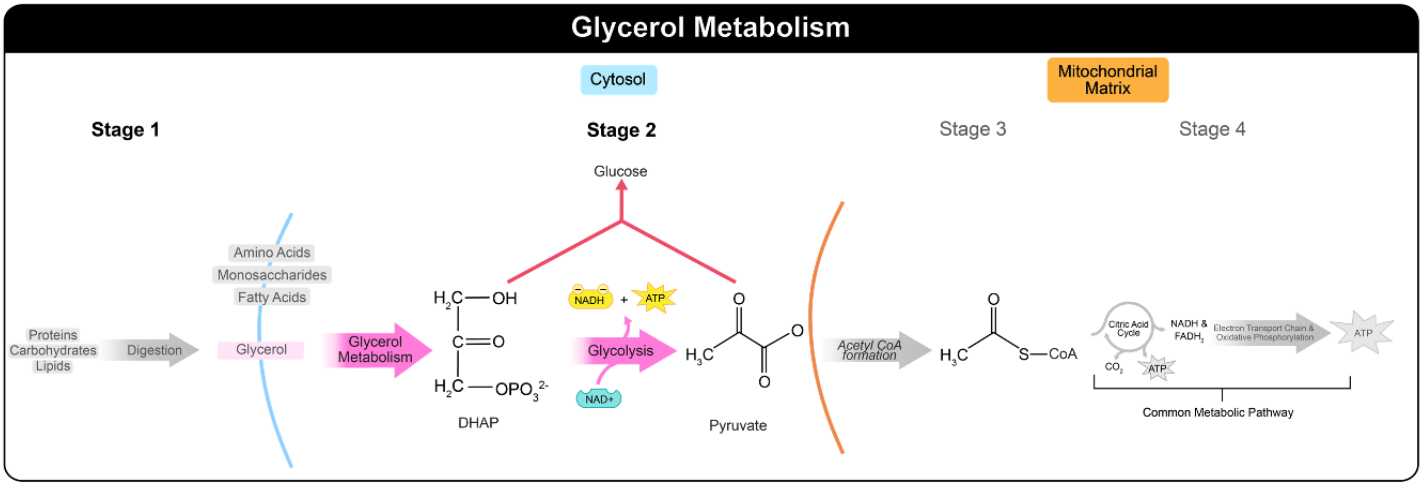
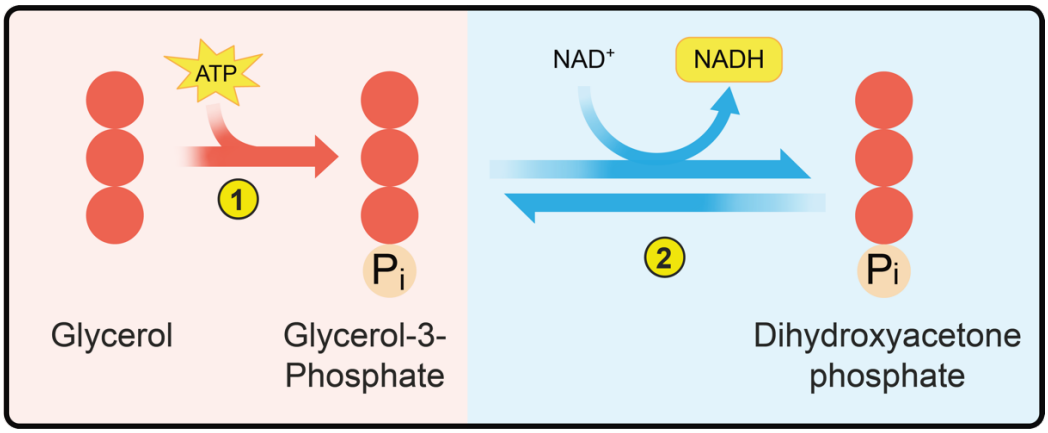
CONCEPT: GLYCEROL METABOLISM

- The main purpose of glycerol metabolism is ATP production through _____.
  - □ A secondary function is energy storage 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) It involves an oxidative phosphorylation step.

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

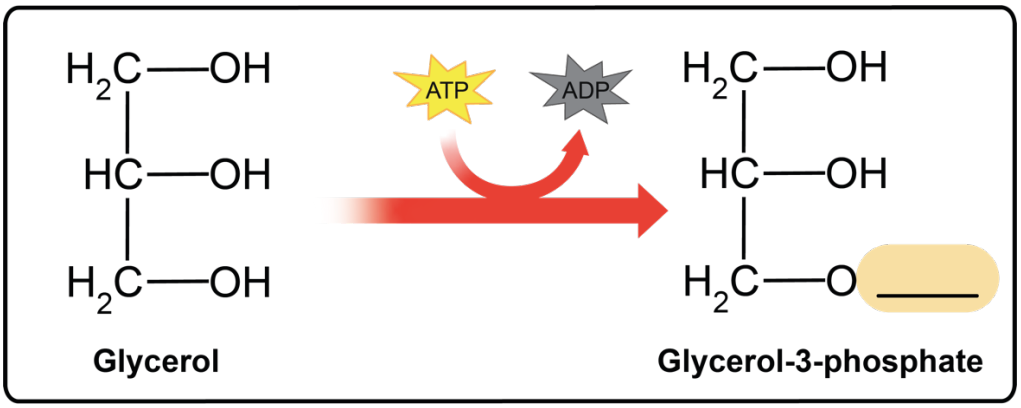
c) A source of glycerol is from the triacylglycerol molecule that must first undergo hydrolysis.

d) A hydrolase enzyme can be used in the first step to convert glycerol to glycerol-3-phosphate.

CONCEPT: GLYCEROL METABOLISM

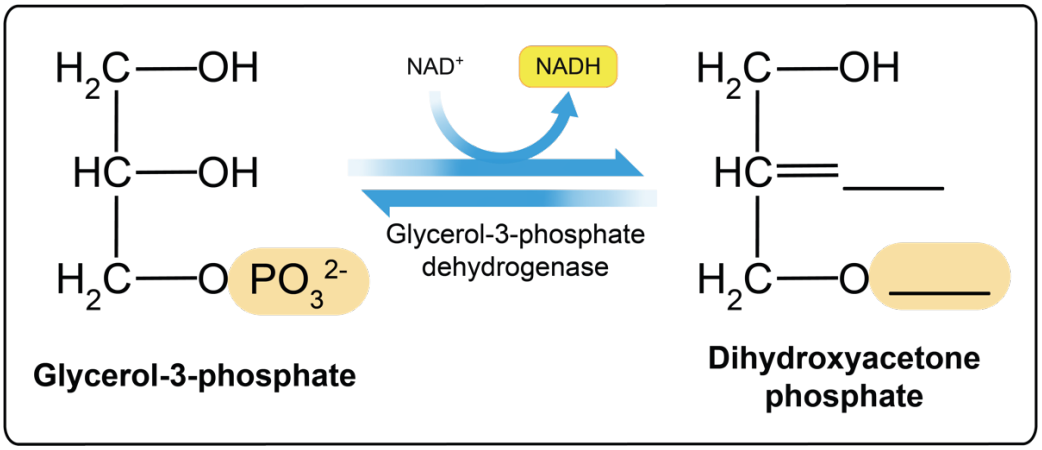
1 Phosphorylation: the enzyme glycerol _____ catalyzes the phosphorylation of glycerol.

□ Uses ATP as a source of energy and _____.



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 or Reaction __ of gluconeogenesis.

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.

CONCEPT: GLYCEROL METABOLISM

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

PRACTICE: The glycerol derived from lipolysis of a triglyceride molecule is converted into glycerol-3-phosphate followed by dihydroxyacetone phosphate. Which step does this dihydroxyacetone phosphate enter in terms of glycolysis?

MEMORY TOOL 4: **G**lenn's **G**rand**P**a made a **F**ruity**P**ie; a **F**ruity**B**erry**P**ie split with **DAPH**ne **G**il**P**in.

MEMORY TOOL 5: **G**reen**P**eas in a **B**aked**P**otato**G**ratin then **3-P**ome**G**ranates and **2-P**ink**G**rapes to **PrEP**are a **P**ie.

a) Step 1 b) Step 3 c) Step 5 d) Step 10