

1. The first reaction in glycolysis that results in the formation of an energy-rich compound (i.e., a compound whose hydrolysis has a highly negative *G’*°) is catalyzed by:
   1. glyceraldehyde 3-phosphate dehydrogenase.
   2. phosphofructokinase-1.
   3. **phosphoglycerate kinase.**
   4. hexokinase.
   5. triose phosphate isomerase.
2. Which of the following coenzymes is required by E1 of the pyruvate dehydrogenase complex for catalytic activity?
   1. **TPP**
   2. lipoic acid
   3. FAD
   4. NAD+
   5. None of the above
3. In alcoholic fermentation, acetaldehyde is produced by
   1. **the decarboxylation of pyruvate**
   2. the carboxylation of pyruvate
   3. the decarboxylation of lactate
   4. the carboxylation of lactate
   5. None of the above
4. Which of the following is required for the conversion of succinate to fumarate in the citric acid cycle?
5. **FAD**
6. GDP
7. NADH2
8. TPP
9. CoQ
10. Which reaction of the citrate acid cycle is most similar to the reaction catalyzed by pyruvate dehydrogenase complex?
    1. succinyl-CoA
    2. citrate to isocitrate
    3. fumerate to malate
    4. malate to oxaloacetate
    5. **-ketoglutarate to succinyl-CoA**
11. What is the net reaction of pyruvate dehydrogenase?
    1. pyruvate + CoA + NADH 🡪 acetyl-CoA + CO2 + NAD+
    2. **pyruvate + CoA + NAD+ 🡪 acetyl-CoA + CO2 + NADH**
    3. pyruvate + CoA + FAD 🡪 acetyl-CoA + CO2 + FADH2
    4. acetyl-CoA + CoA + NAD+ 🡪 pyruvate + CO2 + NADH
    5. none of the above

**Short Answer**

1. In the conversion of glucose to pyruvate via glycolysis, all of the following enzymes participate. Indicate the order in which they function by numbering them one through ten.

\_\_\_ phosphofructokinase

\_\_\_ triose phosphate isomerase

\_\_\_ glyceraldehyde 3-phosphate dehydrogenase

\_\_\_ phosphoglycerate kinase

\_\_\_ hexokinase

\_\_\_ phosphoglucose isomerase

\_\_\_ enolase

\_\_\_ phosphoglycerate mutase

\_\_\_ aldolase

\_\_\_ pyruvate kinase

Name the two enzymes that catalyze a reaction in which ATP is consumed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

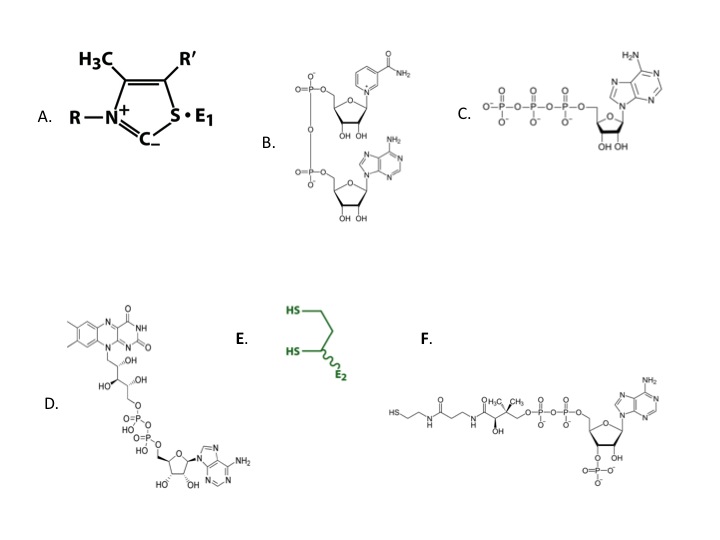
Which enzyme catalyzes a reaction in which NADH is produced? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which enzyme converts G3P into 1,3 BPG? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name two enzyme reactions from glycolysis that operate at G ≈ 0 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Three reactions in glycolysis operate far from equilibrium and are potential sites for major flux control. List the three enzymes and discuss why each enzyme is or is not the RDS of glycolysis.
2. Show the steps of the citric acid cycle *from succinyl-CoA to oxaloacetate only.* For each step, show structures of substrate and product, name the enzyme responsible, and show where cofactors participate
3. (6 pts) Match the names with the following:

|  |  |
| --- | --- |
| **Name** | **Figure letter** |
| NAD+ | B |
| FAD | D |
| CoA | F |
| ATP | C |
| TPP | A |
| Lipoic Acid | E |



**Part III: Short essay**

1. Describe the enzymes, cofactors, intermediates, and products the pyruvate dehydrogenase complex.
2. Succinyl-CoA inhibits both citrate synthase and -ketogluterate dehydrogenase. How is succinyl-CoA able to inhibit both enzymes?
3. ADP stimulates the activity of phosphofructokinase (PFK) yet it is a product of the reaction, not a reactant. Explain this apparently contradictory regulatory strategy.