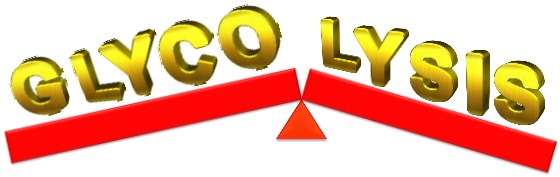
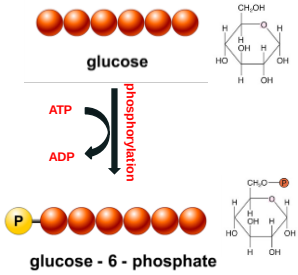
An example in Biology



outline glycolysis to pyruvate with the yield of ATP and reduced NAD^+

10 steps in Glycolysis

1



Glucose receives a phosphate group from ATP

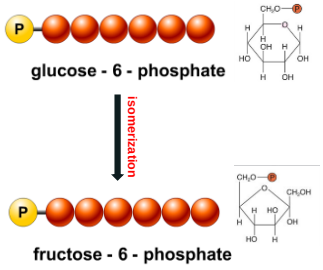
to form glucose-6-phosphate.

Process: phosphorylation

Enzyme: hexokinase

Next Review

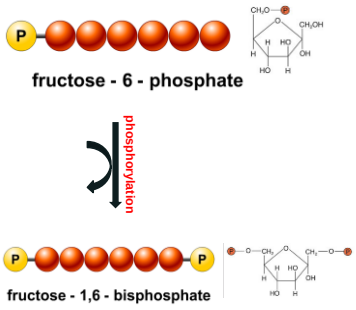
2



- Glucose-6-phosphate converted to its isomer, fructose-6-phosphate.
- Process: Isomerization

Next Review

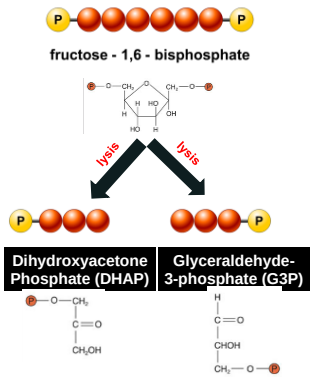
3



- Another ATP is invested to molecule, forming fructose-1,6-bisphosphate.
- Process: Phosphorylation
- Enzyme: Phosphofructo-kinase

Next Review

4

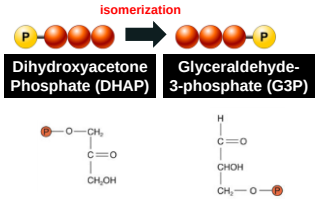


Fructose-1,6-bisphosphate is then split into two 3-carbon sugars, glyceraldehyde-3-phosphate (G3P) and dihydroxyacetone phosphate (DHAP).

Process: Lysis / Cleavage

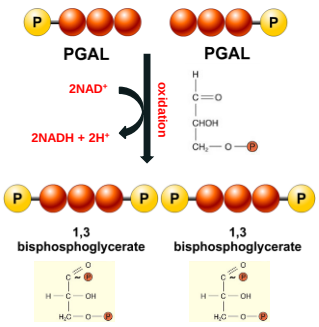
Next Review

5



- Dihydroxyacetone phosphate (DHAP) is converted to its isomer, glyceraldehyde-3-phosphate
- (G3P) a.k.a phosphoglycerate (PGAL)
- Process: Isomerization

Next Review



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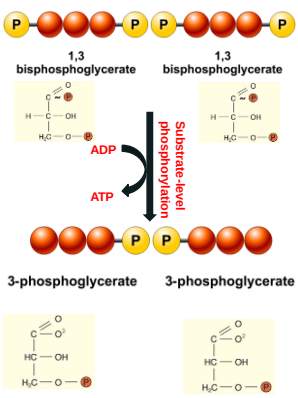
G3P undergoes dehydrogenation with NAD^+ as hydrogen acceptor.

Product of this very exergonic reaction

G3P reacts with inorganic phosphate present in cytosol to yield 1,3-bisphosphoglycerate (BPG).

Process: Oxidation / Dehydrogenation

Next Review

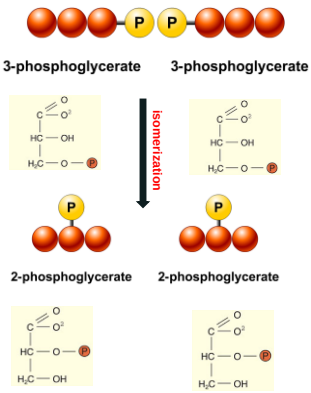


7

One of phosphates of BPG reacts with ADP to form ATP resulting in 3-phosphoglycerate (3PG).

Process: Substrate-level phosphorylation

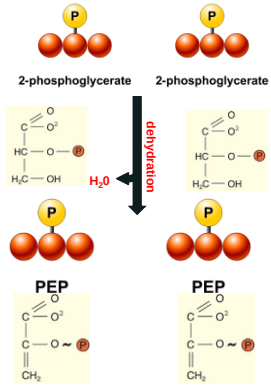
Next Review



8

- 3PG is rearranged to 2-phosphoglycerate (2PG)
- Process: Isomerization.

Next Review

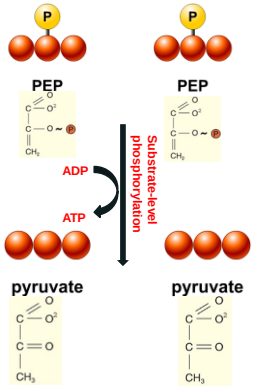


9

ONE molecule of water is removed, which results in formation of double bond. The product, phosphoenolpyruvate (PEP).

Process: Dehydration (removal of water)

Next Review



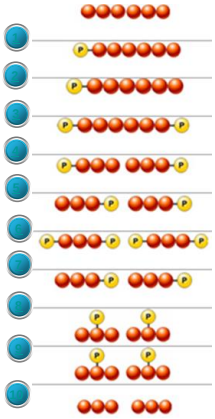
10

Phosphate group of PEP molecules is transferred to ADP to yield ATP and pyruvate.

Process: Substrate-level phosphorylation.

Next Review

Answer the following questions



Energy investing phase

Energy yielding phase

Where reduced NAD^+ is produced

Name of enzymes at 1 & 3

Glycolysis in Lesson Study

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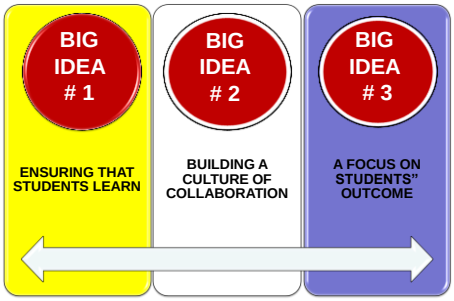
THREE BIG IDEAS



4 CRITICAL QUESTIONS

1. What do we want our students to learn? **(Focus)**
2. How will we know they are learning? **(Inquiry)**
3. How will we respond when they don't learn? **(Innovation)**
4. How will we respond when they do learn? **(Impact)**

Source : *www.allthingsplc.info*

Learning Outcomes

- By the end of the lesson, study should be able to:
- **outline glycolysis to pyruvate with the yield of ATP and reduced NAD^+**

Question 1

What is do you we want our students to learn? (Focus)

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Learning Objectives

At the end of the tutorial lesson, 80% of the students are able to:

- state the definition of glycolysis and the location where it occurs in a eukaryotic cell
- state the 10 steps of reaction involved glycolyis
- identify correctly at least 4 types of chemical reactions during glycolysis
- state the reactions where hexokinase and phosphofructokinase are involved in glycolysis
- state the steps during glycolysis when energy is invested and steps where energy is yielded

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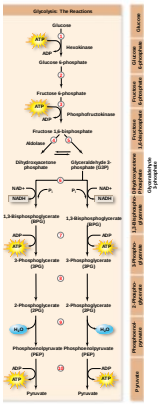
Learning Objectives

- indicate the free energy level for each intermediate product during glycolysis
- show where ATP is invested & yielded and where NAD^+ is reduced during glycolysis
- indicate the two phases in glycolysis
- justify the total ATP produced during glycolysis
- able to scor the lesson

Question 2

How do we know they are learning? (Inquiry)

Review of Glycolysis



BIG IDEA #1: Ensuring that Students Learn

Question 3

What will we respond when they don't learn? (Innovation)

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BIG IDEA #2: Building a Culture of Collaboration

BIG IDEA #3: A focus on Students' Outcome

Question 3

What will we respond when they don't learn? (Innovation)

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Documentation and sharing

When Students' learn….

Evidence

✓Praise them

✓Lesson Study Sharing session

Convention PLC (6-8 Sep 2016)

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