

## GLYCOLYSIS/FERMENTATION WITH MOLECULAR MODELS page 29

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[http://biology.clc.uc.edu/fankhauser/Labs/Cell\\_Biology/glycolysis/Glycolysis.htm](http://biology.clc.uc.edu/fankhauser/Labs/Cell_Biology/glycolysis/Glycolysis.htm)

**SET UP:** You will be assigned one of the following molecules in the glycolysis/fermentation pathway to construct.

MOLECULE	ENZYME ACTING ON IT
1) Glucose	hexokinase
2) Glucose-6-phosphate	phosphoglucisomerase
3) Fructose-6-phosphate	phosphofructokinase
4) Fructose-1,6-bisphosphate	aldolase
5) Dihydroxyacetone phosphate	triose isomerase
6) Glyceraldehyde-3-phosphate*	glyceraldehyde-3-PO <sub>4</sub> dehydrogenase
7) 1,3-bisphosphoglycerate*	phosphoglycerokinase
8) 3-phosphoglycerate	phosphoglyceromutase
9) 2-phosphoglycerate*	enolase
10) Phosphoenolpyruvate	pyruvate kinase
11) Pyruvate	pyruvate reductase or pyruvate decarboxylase
12) Lactic acid	[product of fermentation in muscle]
13) Acetaldehyde, Carbon dioxide & Ethanol	alcohol dehydrogenase [alcoholic fermentation]

\*Discussing the significance of the reactions of these is a bit more challenging than the rest...

On a full page in your notebook, you should list the following information and memorize it:

**MEMORIZE:**

- 1) Give the name and structure of the your molecule.
- 2) How do you recognize it? (Especially discuss bonds involving phosphate)
- 3) How does it differ from the previous molecule?
- 4) How it will be changed into the next molecule and why?
- 5) Name of the enzyme which acts on it and the meaning of the name.

**AT THE BOARD:** Illustrate your molecule in proper sequence of the metabolic pathway.

**IN YOUR NOTEBOOK:** Copy the whole pathway into your notebook on facing pages.

**CONSTRUCTION:** In straight chain display of organic molecules, the vertical carbon back bone projects *away* and horizontal bonds project *towards* the observer. Use appropriate connecting bonds: C-C = gray medium, double bonds = gray long flexible, C-H = white stubby bonds.

**DISCUSSION:** Arrange students with their molecules in sequence in a circle and have each student in succession give the above information. Have students with selected phosphorylated molecules (i.e., glucose-6-phosphate, 1,3 bisphosphoglycerate and phosphoenolpyruvate) name and discuss the bonds by which phosphate is attached and their relative energy content. Have them perform hydrolysis of these bonds using a water molecule and discuss the products.

**PRACTICE QUIZ:** Have students leave the room. Randomize the molecules around the room, numbered 1 through 12. On a fresh page in their notebook, students write a column of numbers, 1 through 12. They then go from model to numbered model, naming them without looking at their notes. Collect and redistribute notebooks to be graded by fellow students.

**VIDEOS:** These videos are in the library. They are on glucose catabolism from *Films for the Humanities and Sciences* series which review the process students have been working on:

VIDT	QH 633 .C45 1992 pt.1	Cell and Energy	(Series Title-Cellular Respiration)
VIDT	QH 633 .C45 1992 pt.2	Glycolysis 1	(Series Title-Cellular Respiration)
VIDT	QH 633 .C45 1992 pt.3	Glycolysis 2	(Series Title-Cellular Respiration)
VIDT	QH 633 .C45 1992 pt.4	The Krebs Cycle	(Series Title-Cellular Respiration)
VIDT	QH 633 .C45 1992 pt.5	Oxidative Phosphorylation	(Series Title-Cellular Respiration)

Glucose

Glucose-6-phosphate

Fructose-6-phosphate

Fructose-1,6-bisphosphate

Dihydroxyacetone phosphate

Glyceraldehyde-3-phosphate

1,3-bisphosphoglycerate

3-phosphoglycerate

2-phosphoglycerate

Phosphoenolpyruvate

Pyruvate

Lactic Acid

Acetaldehyde

Carbon dioxide and Ethanol

1

6

11

2

7

12

3

8

13

4

9

14

5

10

15

