

Glycolysis Karaoke: User's Guide

Introduction:

[Glycolysis Karaoke?](#) Why in the world would I bother to make such a thing? And why would I expect anyone to use it?

It's all about learning – deep, substantial, permanent learning –informed by insights emerging from cognitive science (explained in the book [Make it Stick](#)). My hypothesis is that

1. If you become familiar with my original [Glycolysis Rap](#), and
2. Then try to sing it yourself following the fill-in-the-blanks lyrics on the screen of the [Karaoke version](#), then
3. Your path to memorizing the material in the song will be much more efficient than just about anything else that you can do.

That's because interacting with the song in this way is *effortful*. This is not an easy task. But if you do the hard work of trying to memorize the lyrics in this guided way, you'll learn a lot about glycolysis. Fill-in-the-blanks karaoke is going to help you to transfer the information to where you need it: into long term memory, where it will be available for that upcoming discussion session or test.

There are, of course, alternatives to remembering this material. Flashcards are another great way that forces you to recall what you know, and thereby encodes your learning in long-term memory. I have [glycolysis flashcards](#) set up for you at my website.

Give it a try. It's going to be difficult. You won't get it right the first time. Keep on going back and forth between the fill-in-the-blank lyrics on the next page, and the original lyrics (with all the blanks filled in) that follow. Eventually, you'll be able to sing the Karaoke version fluently. And my hypothesis is that if you can do that, you'll have learned a lot about glycolysis in a fairly permanent way.

Please leave me a comment letting me know what you think.

Glycolysis Rap, Karaoke Version

View it at www.sciencemusicvideos.com

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Glycolysis is a series of _____,
_____ actions, _____ transactions,
Takes _____ a molecule so _____,
Breaks it down for _____ and _____

It's an _____ pathway that amazes
Organized easily into _____ phases,
_____, _____, and _____ harvest,
Tell me later which one you like best.

Investment: _____'s supplied,
Cleavage: our _____ carbon sugar _____
_____: we get our _____ yield,
So beautiful, so intricate keep your eyes peeled

CHORUS

Come on _____, come on _____, for the _____.
For the _____.

_____'s like _____ a match,
That _____ you put in makes the _____ catch
For glycolysis investments two _____,
Which act as _____

Enzymes take _____ from _____
Jam 'em on a _____ rearranging it to _____,
Leaving _____ - _____ on the table,
With two _____, it's highly _____!

Moving us to the second phase
The _____ of _____
Cause glycolysis means "_____ _____" you can see
cleavage yields _____ molecules with _____

One is _____ 3 _____,
It continues on our _____ broken down for _____
But the second one an _____ will immediately,
Convert into a second _____

CHORUS

Phase 3: G3P gets _____ and _____,
By an enzymatic _____,
That harvest _____ from each _____
One _____ and 2 _____

_____ this yield per G3P
To _____ NADH and _____ ATPs
That's the _____ yield for every _____ in
A generous accounting of _____'s win

But two _____ were _____ in phase 1
So you _____ just _____ you can use to jump or run,
Put _____ in, get _____ out, your _____ gain is two,
Two _____ that you can use.

If that doesn't seem like _____, it's cause it _____,
There's tons of _____ left in _____,
The _____ - _____ molecules we're left with at the
end.
And what happens to _____'s gonna depend,

On the _____ where _____ gets sent,
If its _____ it'll be _____
But in _____ cells _____'s termination
Will be the _____ cycle and total _____!

CHORUS

_____ starts with _____
of two _____ to the _____ that we started with,
The product is _____ into two _____
From which the cell _____ and _____.

This _____ pathway is _____'s first phase,
It's _____ of year's old _____ in _____ days
before _____ accumulated in the _____,
Before _____ cells arrived on the scene

It's _____, ubiquitous, in _____,
Bacteria, sequoia tree, no matter your _____,
Happens in the _____ doesn't need no _____.
You wanna find _____? Look in any _____!

(original lyrics follow on the next page)

Glycolysis Rap

View it at www.sciencemusicvideos.com

Glenn Wolkenfeld © 2012

Glycolysis is a series of reactions,
Enzymatic actions, energy transactions,
Takes glucose, a molecule so sugary,
Breaks it down for NADH and ATP

It's an anaerobic cytoplasmic pathway that amazes
Organized easily into three phases,
Investment, cleavage, and energy harvest,
Tell me later which one you like best.

Investment: activation energy's supplied,
Cleavage: our six carbon sugar divides
Harvest: we get our energy yield,
So beautiful, so intricate keep your eyes peeled

CHORUS

Glycolysis!

Come on sugar, come on sugar for the breakdown,

Investment's like striking a match,
That energy you put in makes the fire catch
For glycolysis investments two ATPs,
Which act as activation energy

Enzymes take phosphate from ATPs
Jam 'em on a glucose rearranging it to fructose,
Leaving Fructose 1- 6 bisphosphate on the table,
With two phosphates, it's highly unstable!

Moving us to the second phase
The cleaving of Fructose bisphosphate
Cause *glycolysis* means *splitting sugar*, you can see
cleavage yields two molecules with carbons three

One is glyceraldehyde 3 phosphate G3P
It continues on our pathway broken down for energy
But the second one an enzyme will immediately,
Convert into a second G3P

CHORUS

Phase 3: G3P gets rearranged and oxidized,
By an enzymatic assembly line,
That harvest energy from each G3P
One NADH and 2 ATPs

Double this yield per G3P
To two NADH and 4 ATPs
That's the gross yield for every glucose in
A generous accounting of glycolysis's win

But 2ATPs were invested in phase 1
So you net just two you can use to jump or run,
Put two in, get four out, your net gain is two,
Two ATPs that you can use.

If that doesn't seem like very much, it's cause it ain't,
There's tons of energy left in pyruvate,
The two three carbon molecules we're left with at the end.
And what happens to pyruvate is gonna depend,

On the metabolic pathway where pyruvate gets sent,
If its anaerobic it'll be fermented
But in aerobic cells pyruvate's termination
Will be the Krebs cycle and total oxidation!

CHORUS

Review: glycolysis starts with investment
of two ATPs to the glucose that we started with,
The product is cleaved into two G3Ps
From which the cell harvests NADH and ATPs.

This anaerobic pathway is respiration's first phase,
It's billions of year's old evolved in ancient days
before O₂ accumulated in the seas, before
eukaryotic cells like ours arrived on the scene

It's everywhere, ubiquitous, in every organism,
Bacteria, sequoia tree, no matter your metabolism,
Happens in the cytoplasm doesn't need no organelles.
You wanna find glycolysis? Look in any cell!!!