



Bob Eisenberg <bob.eisenberg@gmail.com>

IMPORTANT time dependence in the Henderson Liquid Junction1 message

Bob Eisenberg <bob.eisenberg@gmail.com>

Sun, Sep 28, 2014 at 8:50 AM

Reply-To: bob.eisenberg@gmail.com

To: Shixin Xu <xsxztr@hotmail.com>

Cc: Chun Liu <liu@math.psu.edu>, Tanran Zhang <xubu3@163.com>, Ardyth at Gmail <ardyth.eisenberg@gmail.com>, "Bob Eisenberg beisenbe@rush" <beisenbe@rush.edu>

Dear Shixin,

Indeed, the first months can be just awful.
I am glad that is over!!!

About the calculations.

This is tricky. There are EXPERIMENTAL indications that there may be no steady state solution or the only steady state solution may occur after exceedingly long times (many hours or days) AFTER CONVECTION HAS CHANGED CONCENTRATIONS.

Experiments are always done on a MUCH MUCH shorter time scale which may in fact NOT be a stationary solution but a "short time linear growth in time" solution to the full equations.

It is an experimental fact well documented in a long set of excellent experimental papers that after a long time the liquid junction set up behaves VERY differently from the way we want to behave.

So what do the experimenters do?

They just make a new liquid junction!!!!

Literally, they put the agar in a plastic tube, and when it behaves badly they cut it with scissors making in effect a new junction.

This takes a few seconds or may minutes to settle down (NO ONE KNOWS so I may be very wrong here. It might settle down in milliseconds and no one would know, including me)

And then it is usable (i.e, more or less behaves according to the classical Henderson liquid junction potential equation) for many hours.

I hope I am wrong and your problem is easier to fix than this,
I say it again, I HOPE I AM WRONG....

but if I am right, you and Chun will need to look at the transient
problem and seek ONLY ONLY ONLY an intermediate time
scale of slow time growth.

That corresponds to the experimental regime used in (no kidding)
at least tens of thousands of papers since 1910 or so, when
Henderson "derived" (incorrectly) his equation

As ever
Bob

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On Sun, Sep 28, 2014 at 7:25 AM, Shixin Xu <xsxztr@hotmail.com> wrote:
Dear Bob,

Thank you for your concern.
Thanks God. Tanran is good now.
I will go back to Suzhou tonight.

For the liquid Junction code, I have finish the first step and do some test.
But the result is not as I expected. Maybe there are some bugs in the code.
I will try to fix it.

In the test, I used the nonflux boundary condition for distribution in y,z direction boundary since I simulate a
tube in x-direction.
I am not sure how large should the computation domain be.

Now the domain is set as $[-15,15]*[-5,5]*[-5,5]$ with unit A.

The diffusion coefficient in the agar is set as following:

$K = 1.64$

$Na = 1.33$

$cl = 1.33$

with unit ($10^9 \text{ m}^2/\text{s}$)

is the water

$K = 1.96$

$Na = 1.33$

$cl = 2.03$

with same unit.

Now the diffusion coefficient is sharp changed at the $x=B$.

One stupid question, the K and Cl ions can pass the membrane at $x=B$ for agar to water, right?

Best regards

Shixin

From: bob.eisenberg@gmail.com

Date: Sun, 28 Sep 2014 07:09:42 -0300

Subject: Henderson Liquid Junction

To: xsxztr@hotmail.com; liu@math.psu.edu

CC: xubu3@163.com; ardyth.eisenberg@gmail.com; beisenbe@rush.edu

Dear Shixin

I hope all is well with you and Tanran and she is one of the lucky ones who does not get "morning sickness" (nausea in the morning in the first trimester of a pregnancy).

With everything else going on you must be very busy, but I do want to ask how things are going with the Henderson Liquid Junction project.

Is there ANYTHING I can do to help?

As ever

Bob

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