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Learning Chemistry On-Line with an Interactive Computer Simulation

eLearning made interactive with STELLA

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student access: bhs

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Outline of Poster Session

- *A. Why eLearning? Why use a SD model?*
- B. Design Criteria: maximum flexibility & feedback
- C. Course Content: 3 units and the model
- D. Student comments
- E. Suggestions for Areas to apply eLearning to
    - ***eLearning + SD = a Winning Team !***

A. The Challenge: Every student learns at a different speed in a different way

A Solution: eLearning made interactive with a SD model

- ***Background:***
- eLearning, made possible by the Internet, has come of age in Industry to meet the necessity for the continuous upgrading of skills

- "Just in Time Learning" means the learner chooses to learn a skill when they need it

- ***In K-12 Education:***
- we have yet to realize the potential that web based learning has for our students

- System Dynamics can help make this a ***more interactive*** medium that goes beyond the dry memorization of facts

B. Work was Funded by Industry Canada

- *Schoolnet.ca* exists to promote the use of the Internet in Schools across Canada with the goal of having every classroom "wired to the world"
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- This Grade 12 level Chemistry unit was developed specifically to showcase the use of System Dynamics models to the world of eLearning

- *I wish to thank High Performance Systems for the use of run-time Stella 6.0 & their Equilibrium model*

The Unit was designed to give the learner maximum flexibility & feedback

The goal is to not overwhelm the student

- The unit is divided into 3 sections with tests at the end of each section
- There is extra work and re- tests for those who want it
- All work is self marked by the student except the final unit test

C. This Unit was made up of 3 parts with a Historical Link to WW I

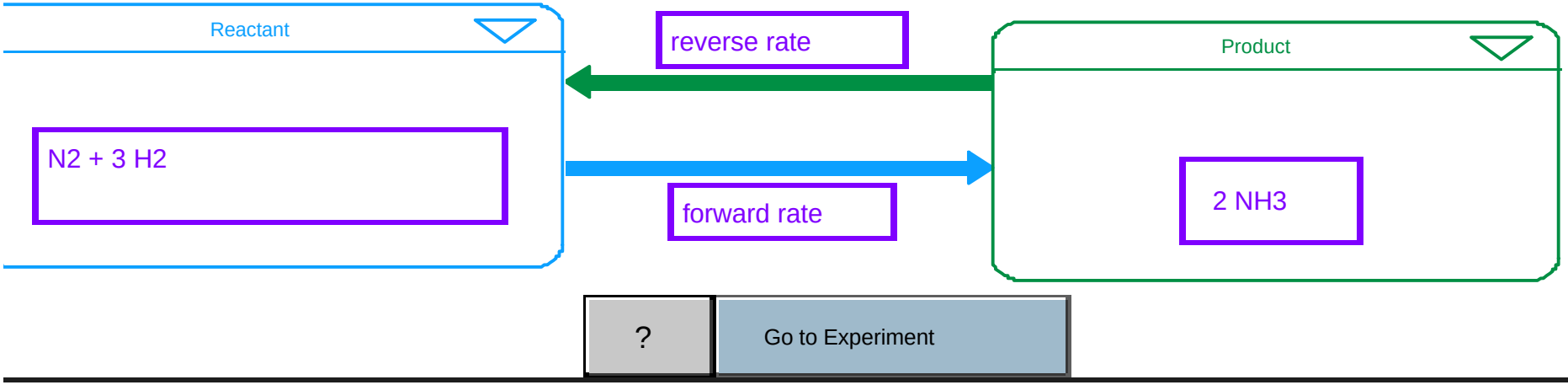
- Section A – Introduction: The Haber Process
  - Dynamic Equilibrium
  - Test, optional retest
- Section B - Computer Simulation with STELLA
  - Change model variables to see effect
  - Test, optional retest
- Section C - Review Questions
  - Practice at other web-sites, Summary
  - Pretest, Test

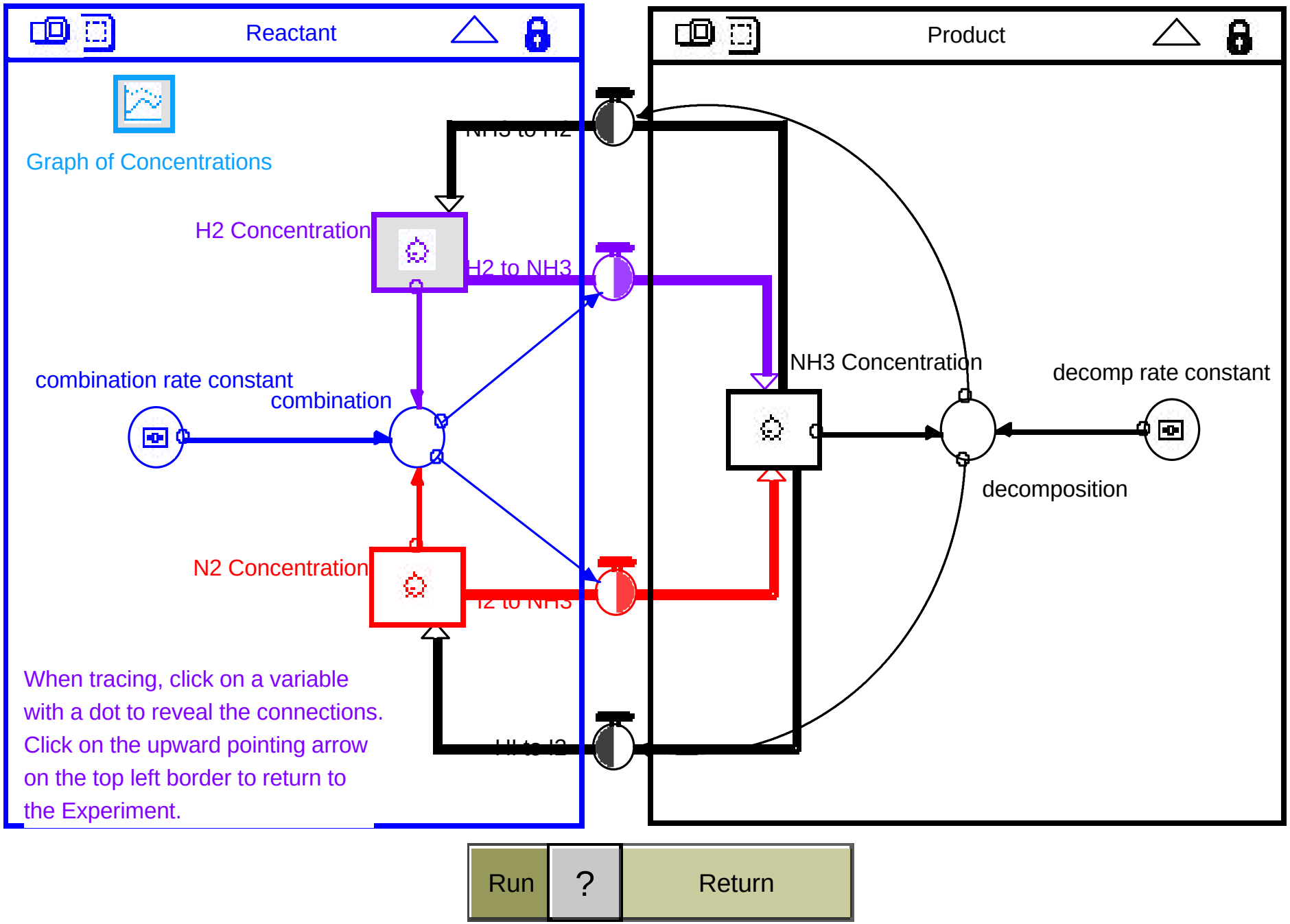
Making Ammonia, the precursor to TNT, is ***THE*** classic Equilibrium Process

The Dynamic of LeChatelier's Principle

LeChatelier's Principle states that when a chemical system is subjected to some perturbation, it will respond in a way that tends to minimize its effect. In this model, you will be able to modify the conditions of a simple reversible reaction in order to experience the ramifications of this principle.

The model depicts a simple, reversible reaction. Experiments with the model can




Reactant
Product
Graph of Concentrations
H2 Concentration
H2 to NH3
combination rate constant
combination
NH3 Concentration
decomp rate constant
decomposition
N2 Concentration
When tracing, click on a variable
with a dot to reveal the connections.
Click on the upward pointing arrow
on the top left border to return to
the Experiment.
Run
?
Return

D. Comments by the Students

- *"I have never learned like this - it feels very strange, yet I like being in charge of my learning."*
- "Why can't learning always be this easy!"
- "This confuses me; can you explain to me exactly what we need to know?"
- *"This is great - I can learn from home too!"*
- "The simulation showed me a side to Equilibrium that I had missed."
- "Having the web-site to ask other students questions is great!"

E. Suggestions for using eLearning

Best used to enhance learning and not to replace conventional Teacher-Student interaction

For students who are “anti-authoritarian” & find the Institution of School unbearable

For students who miss classes due to Illness, Sports, Family matters, or health concerns, etc.

To run classes across a District that would not otherwise have enough enrollment to be cost-effective

In 2003 when there will be twice as many HS grads in Ontario & many students may ***“fall through the cracks”*** unless eLearning is used

eLearning + SD = A Winning Team

Check us out at this temporary site

www.blackboard.com

@ find a course: OACChem

to enroll as a student you'll need this access code: bhs

Enjoy & Just do it !