# pH Scale Sim

design version 4

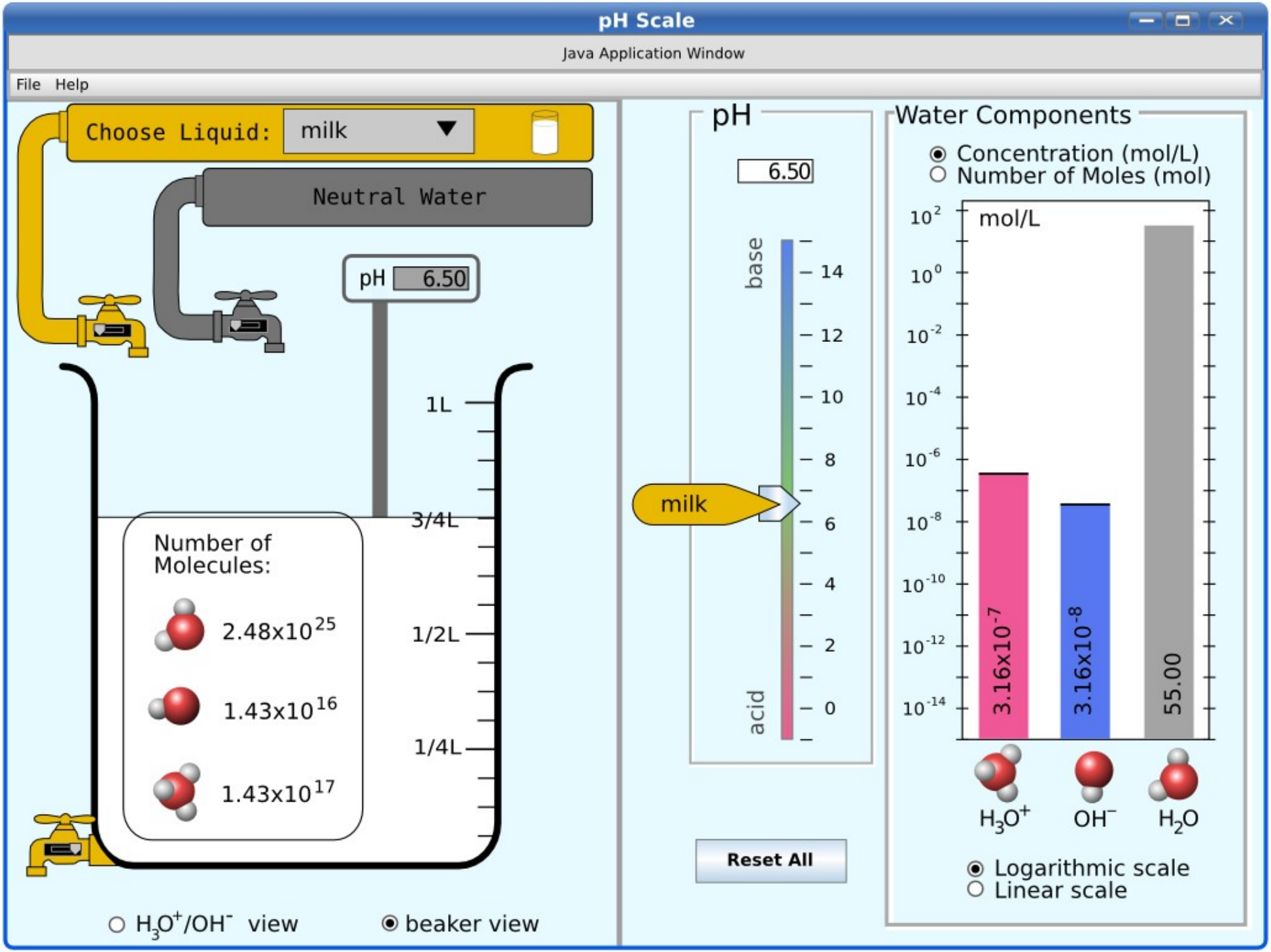
Wendy Adams, Laurie Langdon,Trish Loeblein, Chris Malley,
Archie Paulson, Kathy Perkins

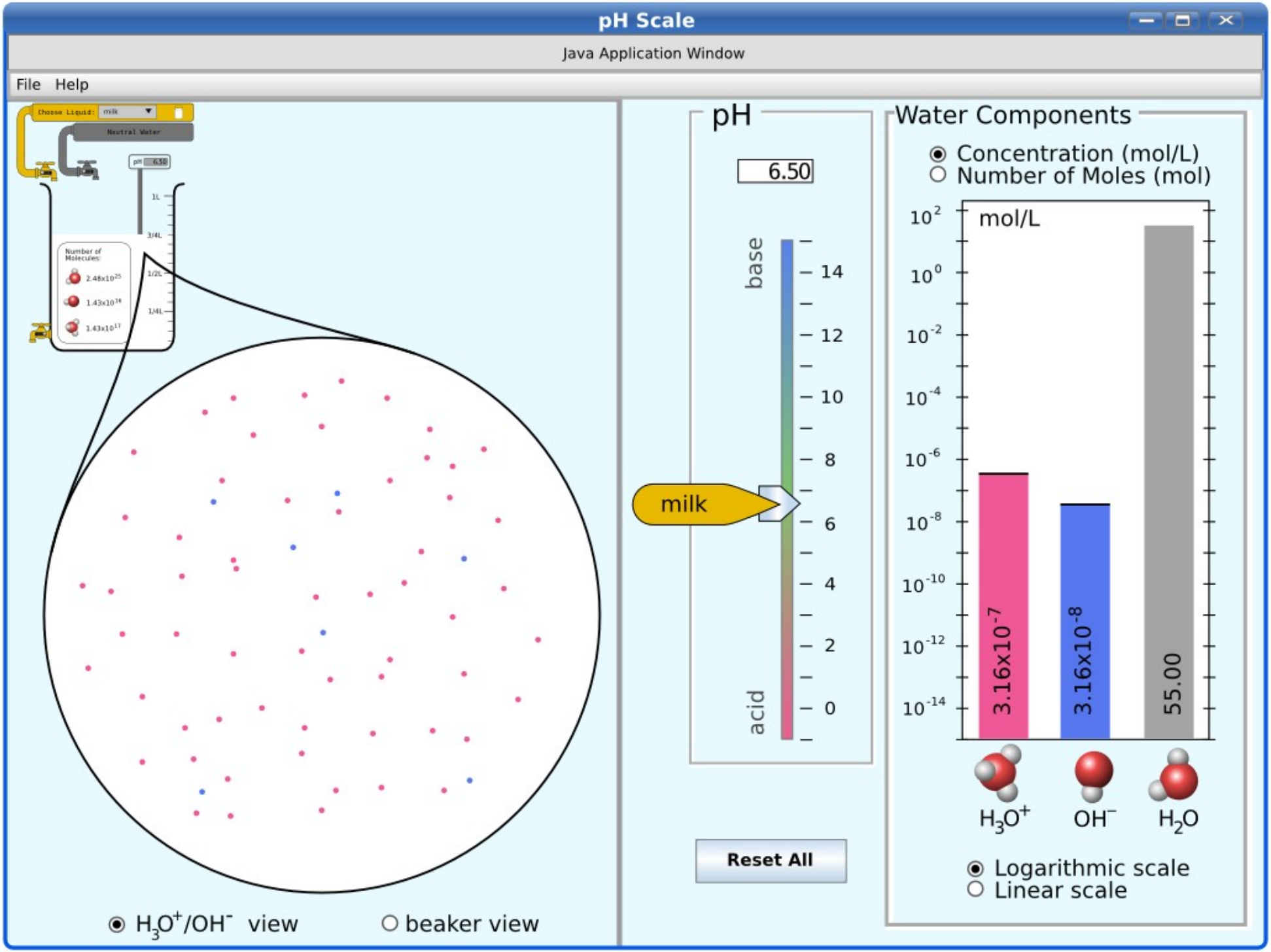
June 2, 2007

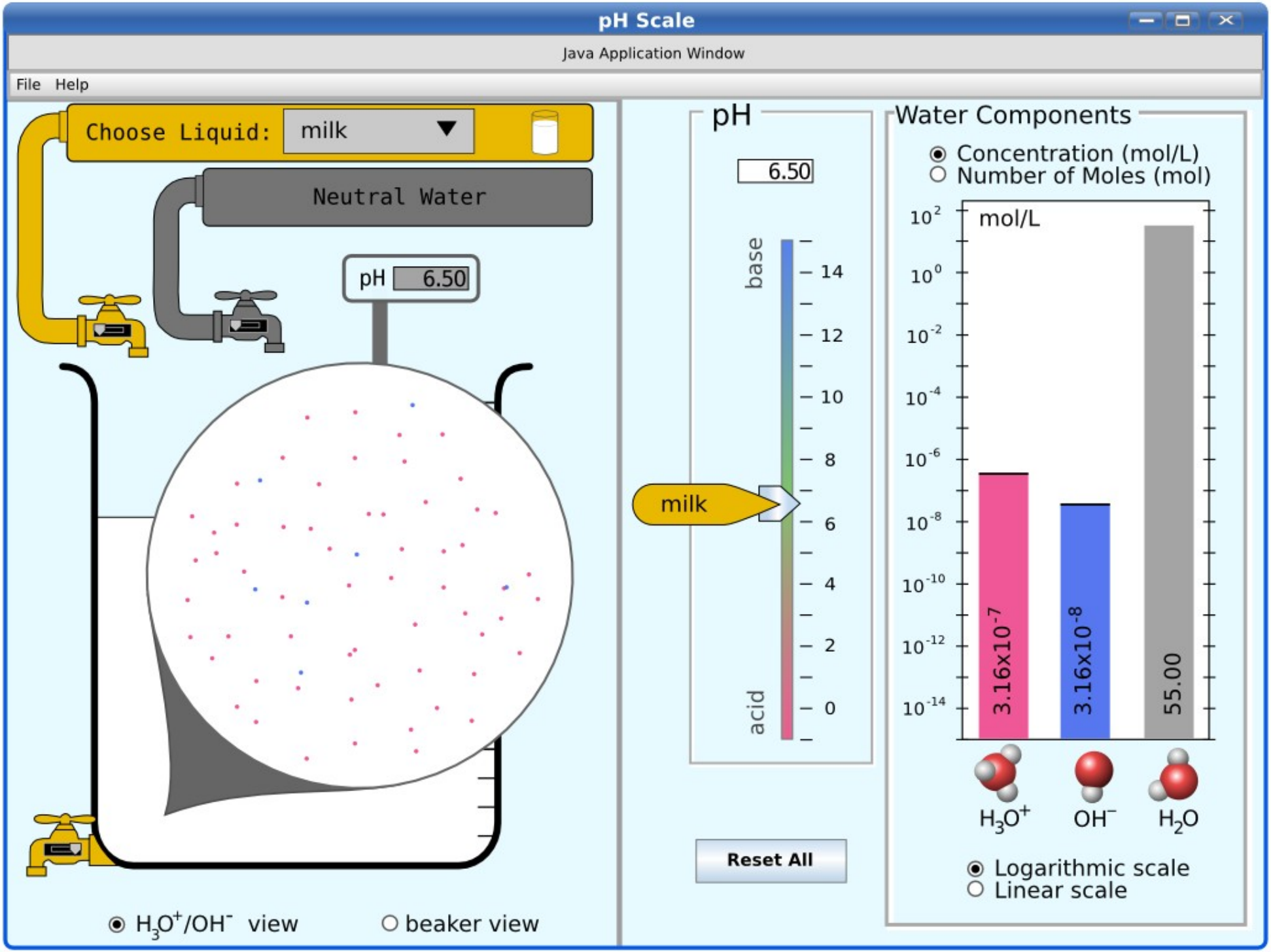
## Contents

# Basic Sim Operation

- pH slider
  - affects the number of speck-molecules shown in the beaker and the bars in the bar chart
  - does not affect the label tag (see "choose a liquid")
- bar charts
  - radio buttons for "concentration" and "number of moles"
  - concentration
    - mol/L bars of both OH and H3O are drag-able, and tied to the pH slider
  - number of moles
    - all three bars are drag-able
    - changing the OH and H3O bars moves the pH slider
    - changing the H2O slider turns on the faucet/drain (for increasing/decreasing the bar height) to change volume in beaker
- faucet and drain
  - cannot fill above 1 liter
  - neutral water can be added to any liquid (it then becomes "custom")
- Choose a liquid
  - when a new liquid is chosen, the beaker liquid disappears and the faucet turns on to fill with the new liquid
  - a label tag appears on the pH slider to indicate the pH of the current and previous liquids chosen
- Number of Molecules
  - continuous display of the number of the three molecules in the beaker


pH Scale
Java Application Window
File Help
Choose Liquid: milk
Neutral Water
pH 6.50
1L
3/4L
1/2L
1/4L
Number of Molecules:
2.48x10^25
1.43x10^16
1.43x10^17
H3O+/OH- view
beaker view
pH
6.50
base
acid
14
12
10
8
6
4
2
0
milk
Reset All
Water Components
Concentration (mol/L)
Number of Moles (mol)
mol/L
10^2
10^0
10^-2
10^-4
10^-6
10^-8
10^-10
10^-12
10^-14
3.16x10^-7
3.16x10^-8
55.00
H3O+
OH-
H2O
Logarithmic scale
Linear scale


pH Scale
Java Application Window
File Help
Choose Liquid: milk
Neutral Water
pH 6.50
1L
3/4L
1/2L
1/4L
Number of Molecules:
2.48x10^25
1.43x10^24
1.43x10^17
pH
6.50
base
acid
14
12
10
8
6
4
2
0
milk
Reset All
Water Components
Concentration (mol/L)
Number of Moles (mol)
mol/L
10^2
10^0
10^-2
10^-4
10^-6
10^-8
10^-10
10^-12
10^-14
3.16x10^-7
3.16x10^-8
55.00
H3O+
OH−
H2O
Logarithmic scale
Linear scale
H3O+/OH- view
beaker view


pH Scale
Java Application Window
File Help
Choose Liquid: milk
Neutral Water
pH 6.50
H3O+/OH- view
beaker view
pH
6.50
base
acid
14
12
10
8
6
4
2
0
milk
Reset All
Water Components
Concentration (mol/L)
Number of Moles (mol)
mol/L
10^2
10^0
10^-2
10^-4
10^-6
10^-8
10^-10
10^-12
10^-14
3.16x10^-7
3.16x10^-8
55.00
H3O+
OH-
H2O
Logarithmic scale
Linear scale

# Learning Goals

Students will be able to use pH scale to write descriptions that demonstrate how to:

A. Determine if a solution is acidic or basic
B. Determine if a solution weak or strong by looking at the pH
C. Place acids or bases in relative order
D. Describe on a molecular scale, with illustrations, how the water equilibrium varies with pH
E. Determine concentration of hydroxide, hydronium and water at a given pH

New learning goals (rough):

1. pH does not change with volume
2. diluting with water moves pH closer to 7

# Outstanding Issues

1. When diluting with water, how does the color of liquid in the vessel change? Can we simply make the color more transparent, or do we need to make the color approach whatever color we use for water?
2. Do the faucets work in microscope mode?

# pH of Common Liquids

The following were taken from the web (http://www.healthnews-nz.com/table5.html).

| | |
|---|---|
| Acid Mine Runoff | -3.6 – 1.0 |
| Battery Acid | < 1.0 |
| Gastric Acid | 2.0 |
| Lemon Juice | 2.4 |
| Cola | 2.5 |
| Vinegar | 2.9 |
| Orange or Apple Juice | 3.5 |
| Beer | 4.5 |
| Coffee | 5.0 |
| Tea | 5.5 |
| Acid Rain | < 5.6 |
| Milk | 6.5 |
| Pure Water | 7.0 |
| Human Saliva | 6.5 – 7.4 |
| Blood | 7.34 – 7.45 |
| Sea Water | 8.0 |
| Hand Soap | 9.0 – 10.0 |
| Household Ammonia | 11.5 |
| Bleach | 12.5 |
| Household Lye | 13.5 |