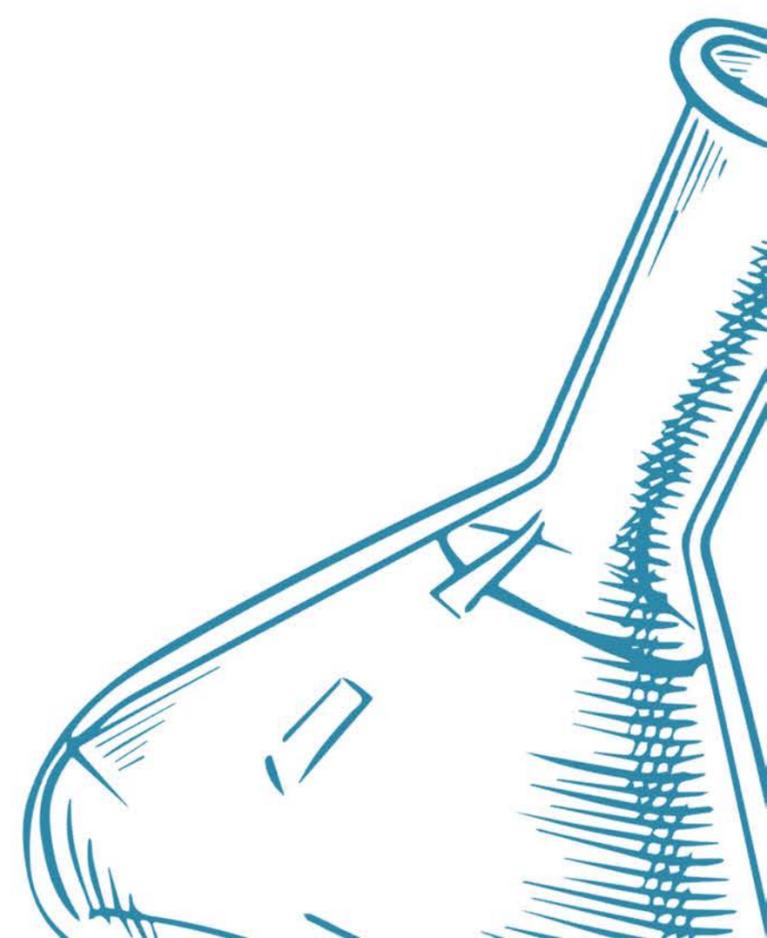
A blue line-art illustration of a molecular structure with several interconnected spheres and lines, located in the top-left corner.

Setting Up A Small-Scale QC Lab

Audrey Skinner
Gastronomical Chemist
NanoCon 2025

A blue line-art illustration of laboratory glassware, including a flask and a beaker, located in the bottom-right corner.

A blue line-art diagram of a molecular structure in the top-left corner, consisting of several interconnected circles of varying sizes representing atoms, connected by lines representing chemical bonds.

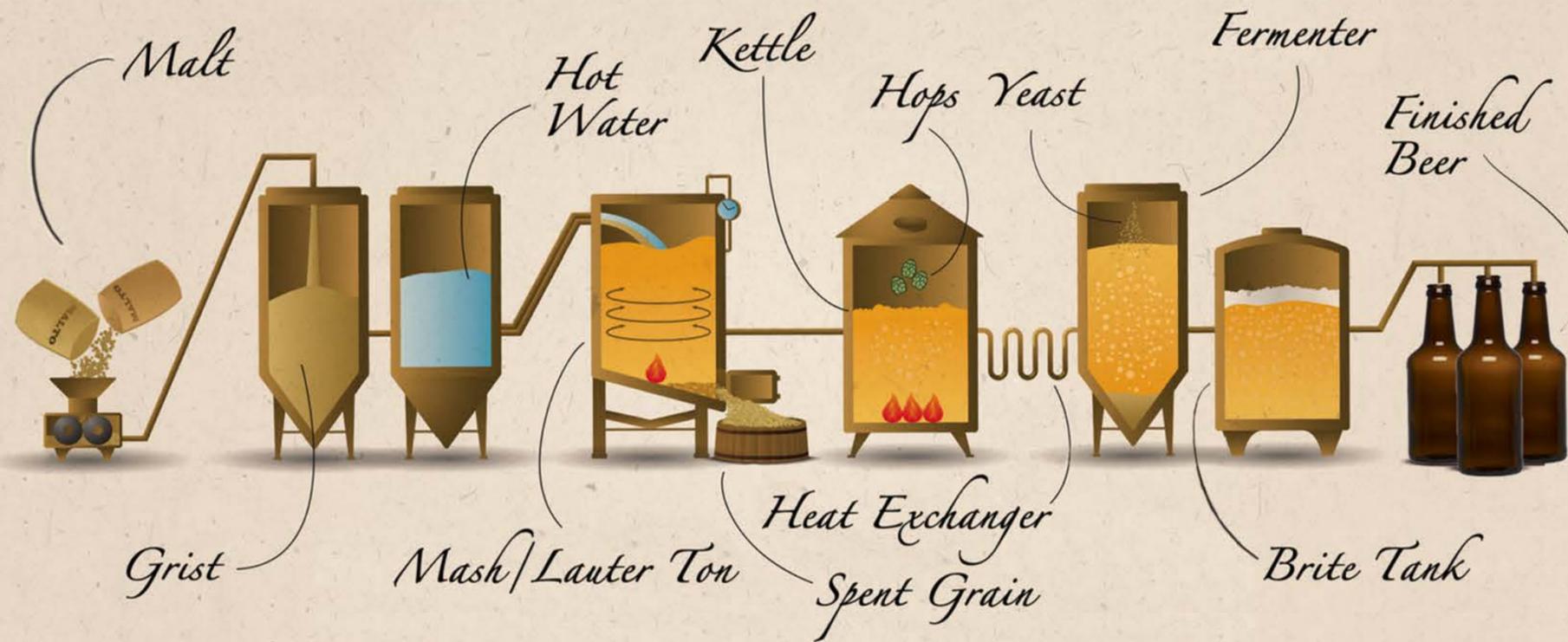
Why is quality control important?

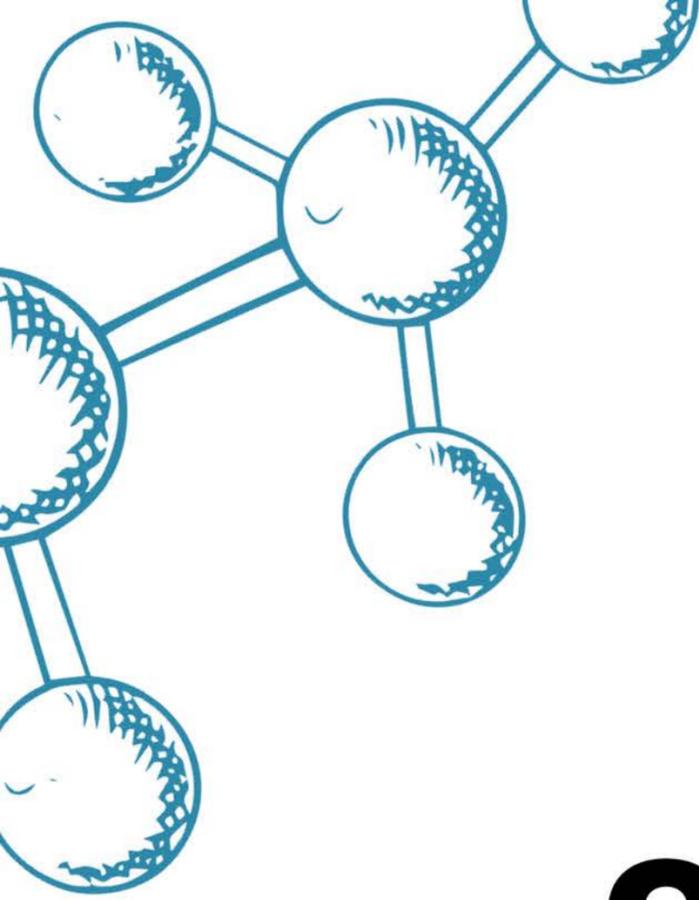
Goal: Make sure each batch meets specifications.

Is it good?

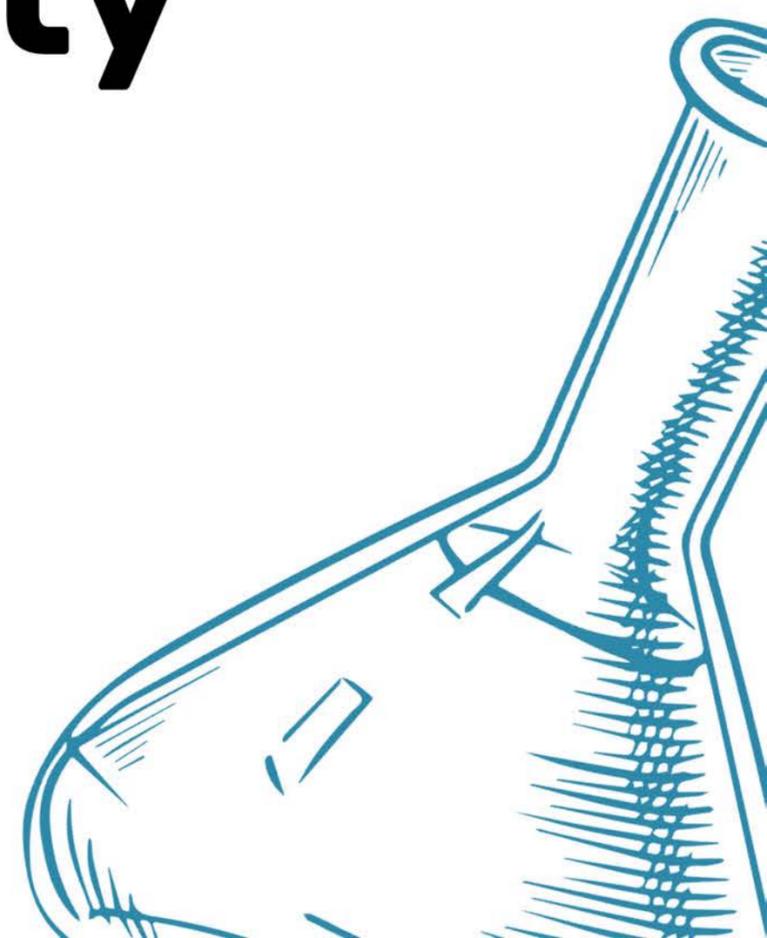
A blue line-art illustration of a microscope in the bottom-right corner, showing the eyepiece, objective lenses, and the main body of the instrument.

The Brewing Process



A blue line-art illustration of a molecular structure in the top-left corner, consisting of several interconnected spheres of varying sizes and textures, representing atoms or molecules.

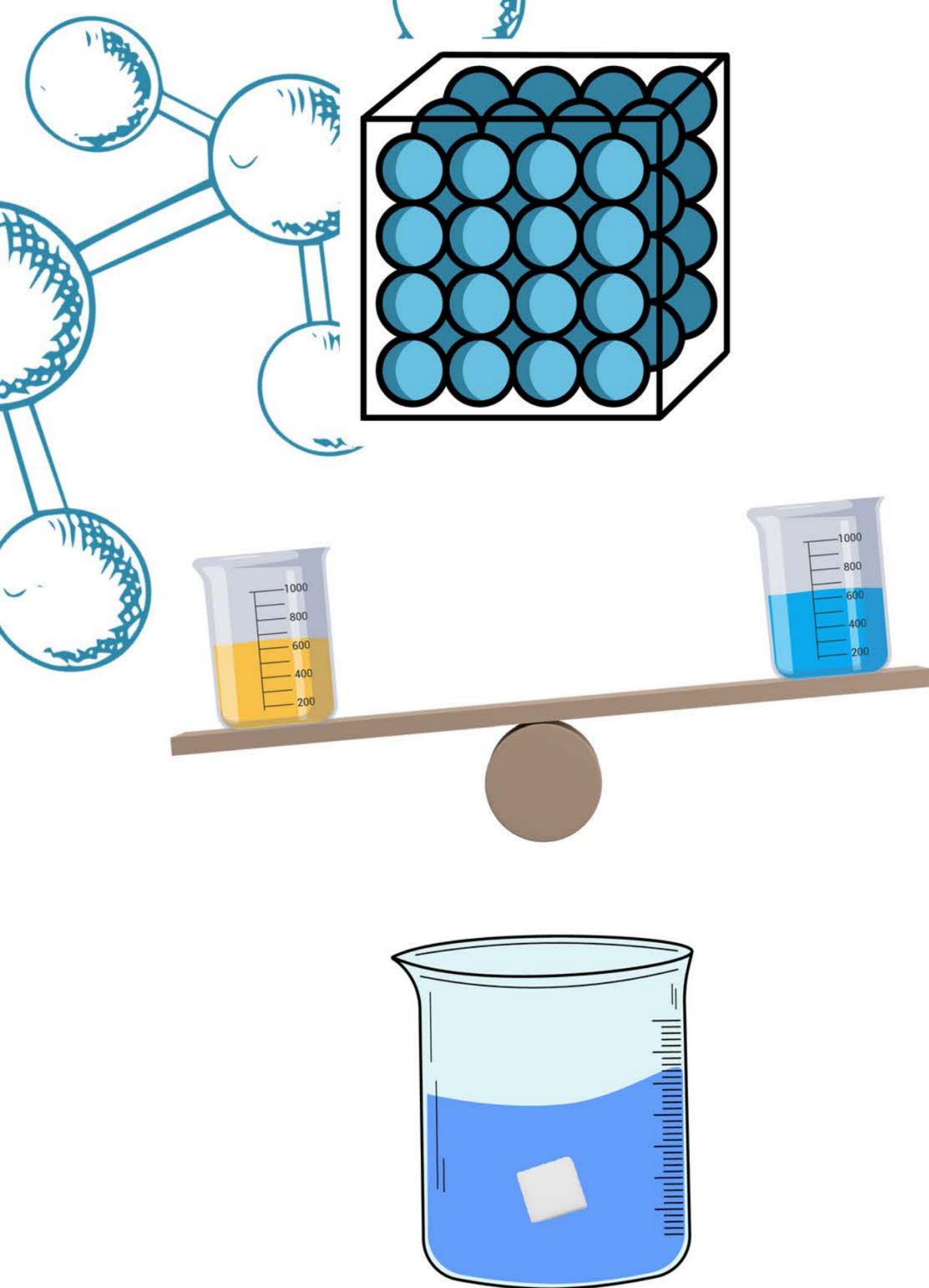
Original & Final Gravity

A blue line-art illustration of a beer bottle in the bottom-right corner, shown from a low angle looking up into the neck of the bottle, with a textured surface on the glass.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Specific Gravity} = \frac{\text{Density of Wort}}{\text{Density of Water}}$$

$$\text{Degrees Plato (°P)} = \frac{1 \text{ g sugar}}{100 \text{ g solution}}$$



Hydrometer

Measures density via buoyancy

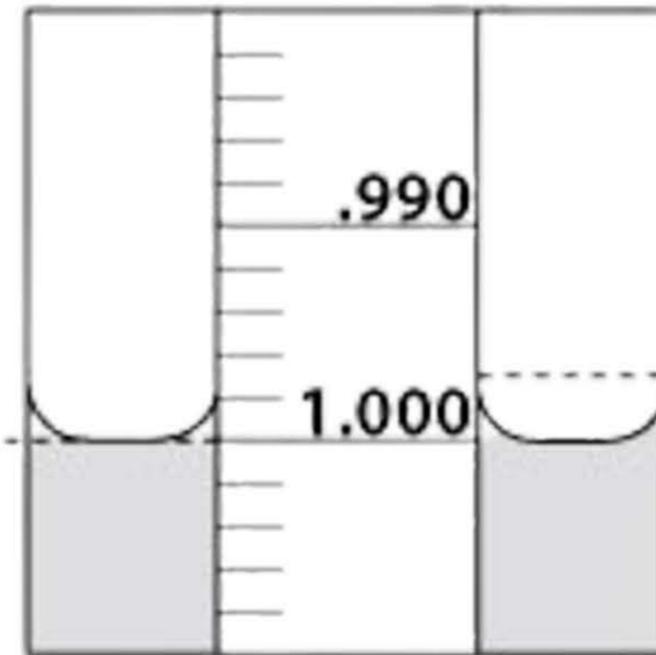
Pros

- Cost: ~\$10-40
- No Maintenance

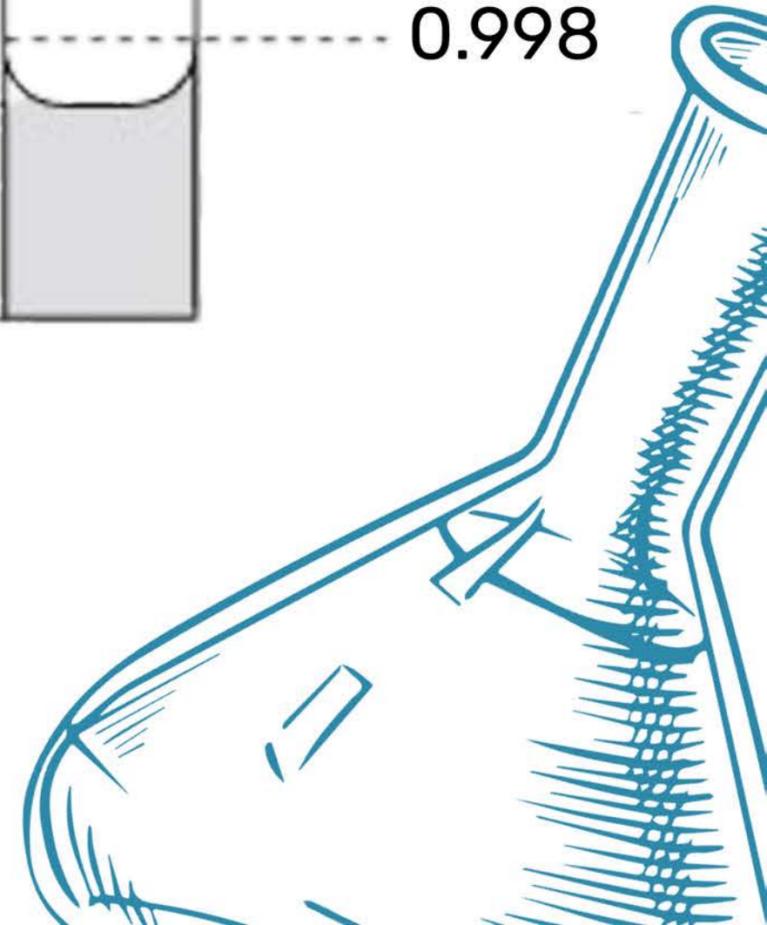
Cons

- Person-to-person variation
- Large sample size
- Fragile

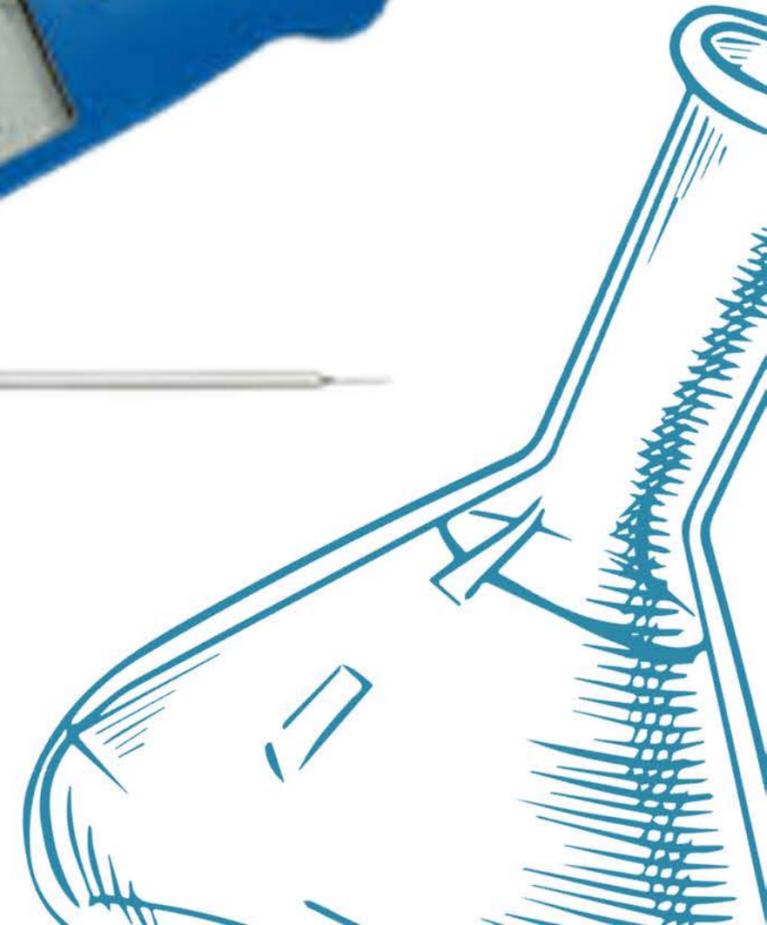
✓
Correct
Reading:
1.000



✗
Incorrect
Reading:
0.998



Thermometer Temperature



Digital Density Meter

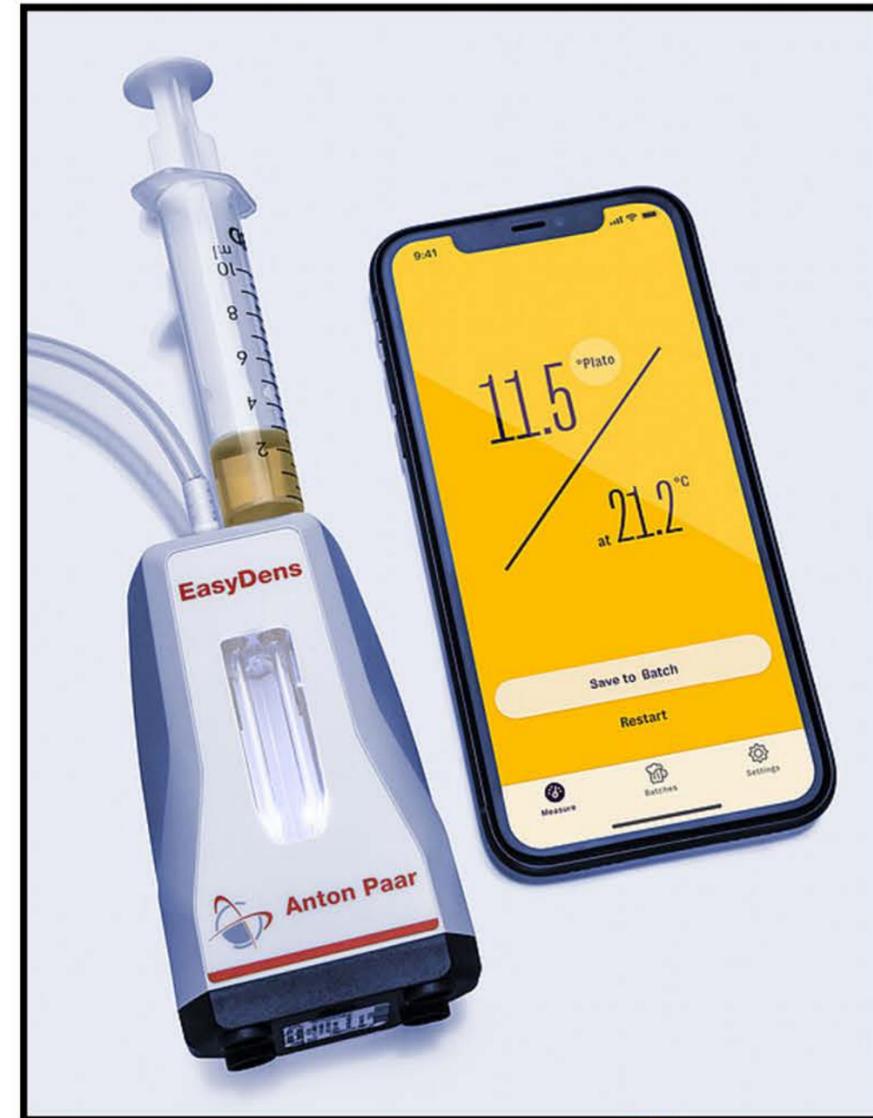
Measures density via U-tube principle

Pros

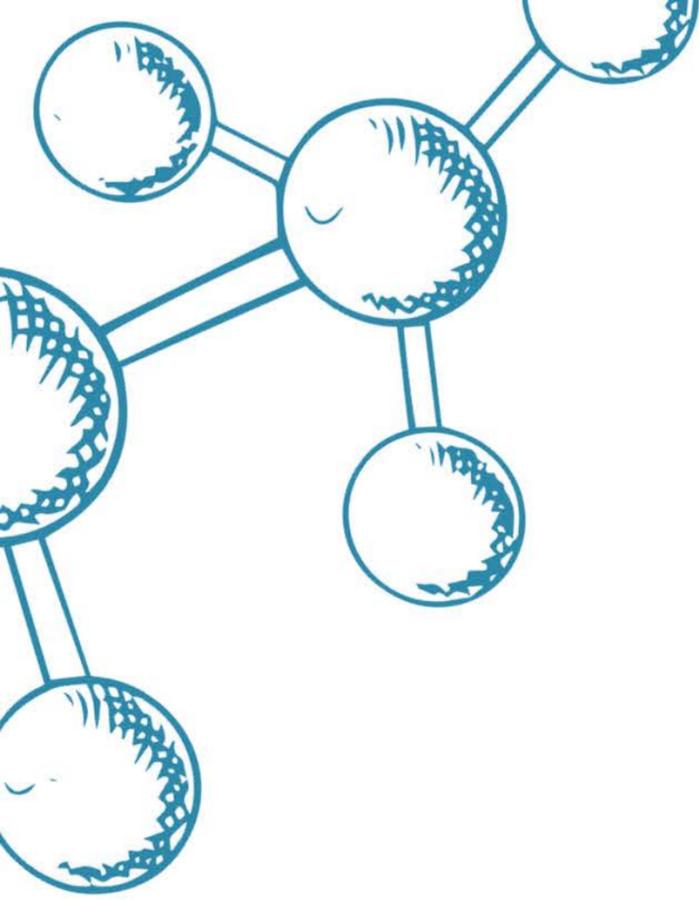
- Small sample size
- Measures temperature simultaneously
- Removes person-to-person variation

Cons

- Cost: ~\$500



pH



pH Meter

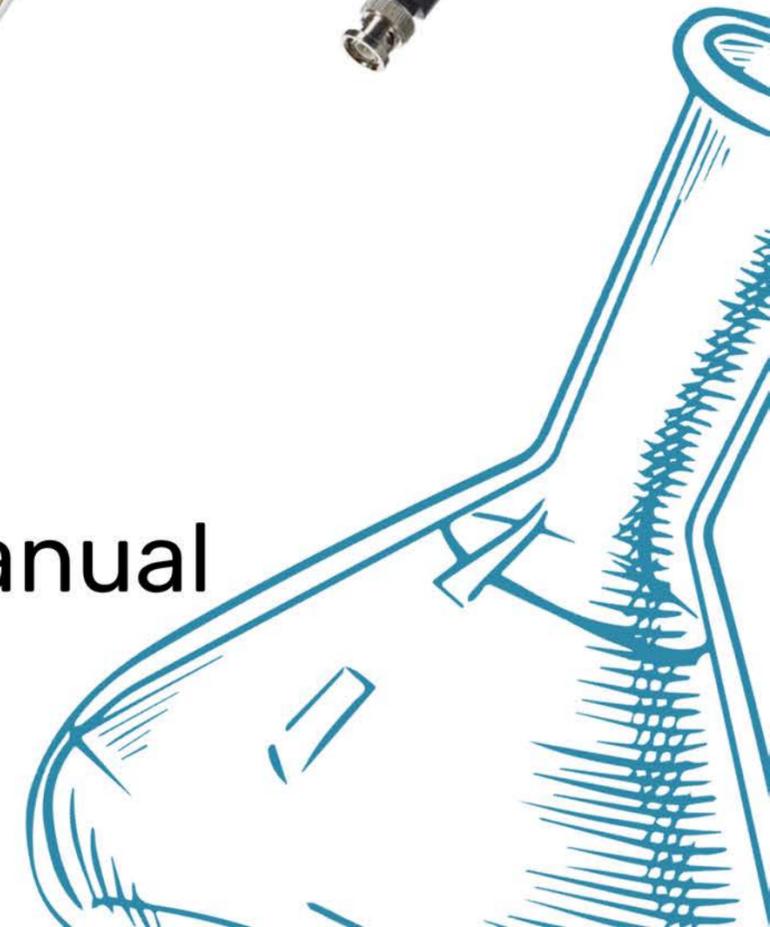
- 2+ calibration points
- Automatic Temperature Compensation (ATC)
- ± 0.02 precision



pH Electrode

Average Life: 1-3 years

- **Body Material:** glass vs epoxy
 - chemical and temperature tolerant vs durable
- **Junction Type:** single vs double
 - cheaper vs higher precision
- **Reference Material:** liquid vs gel
 - aka: refillable vs non-refillable
 - higher accuracy, longer life vs lower maintenance
- **Temperature Measurement:** automatic vs manual
 - built-in vs separate probe required



Stir Plate

- Variable speed



pH Calibration & Measurements



- 1) Calibrate DAILY at 2-3 points, per meter instructions.
- 2) Rinse the probe with DI water.
- 3) Insert the probe into the wort/beer sample, using it to stir.
- 4) Record the pH to the nearest 0.01 pH.
- 5) Recheck calibration to ensure drift hasn't occurred.



Beer samples must be degassed.
Wort samples should be cooled to room temperature.



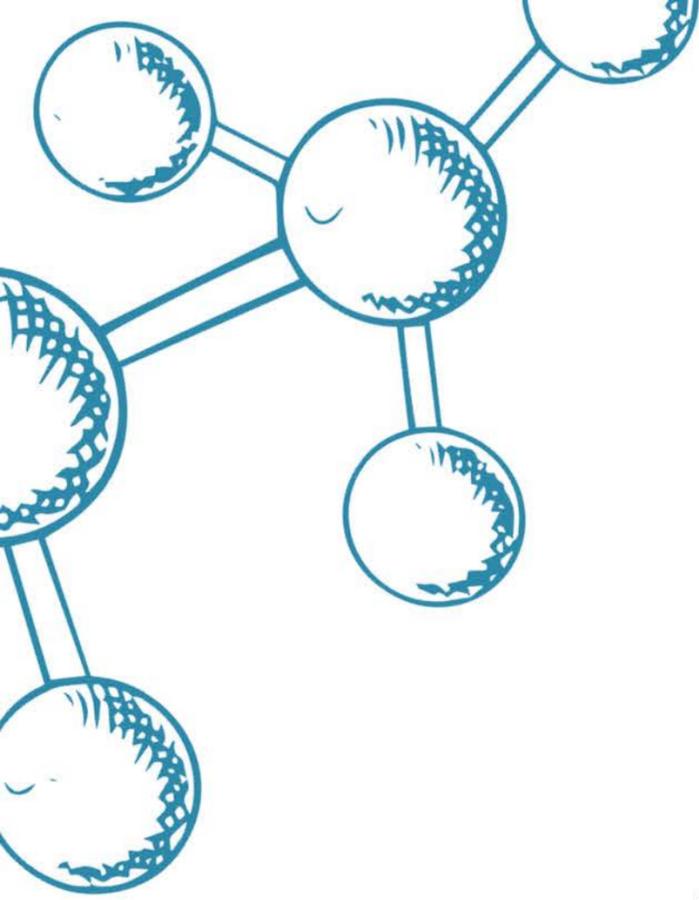
pH Electrode: Care

- Storage solution: 3.5M Potassium chloride (KCl)

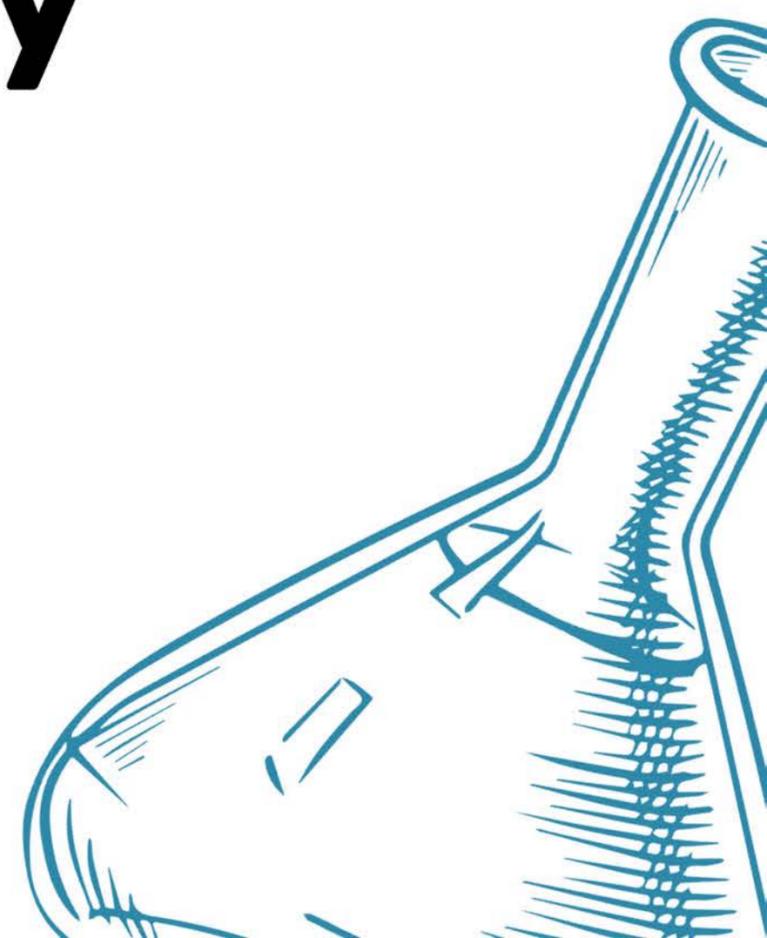
- ★ **Always keep the probe wet!**

- If it isn't actively measuring a sample, put it in storage solution.
- Periodic cleaning may be necessary to remove proteins.
- Drifting?
 - Recalibrate with buffers
 - Drain and refill refillable electrodes.
 - Still drifting? It might be time for a new electrode.



A blue line-art diagram in the top-left corner shows several interconnected circular nodes, some with internal patterns, representing a cellular or molecular network.

Cell Count & Viability

A blue line-art illustration in the bottom-right corner shows a microscope, with the objective lens and eyepiece clearly visible, pointing towards the center of the slide.

Microscope

Eye Piece

Objective Lenses

Coarse & Fine Focus

Eye Piece magnification

x

Objective Lense magnification

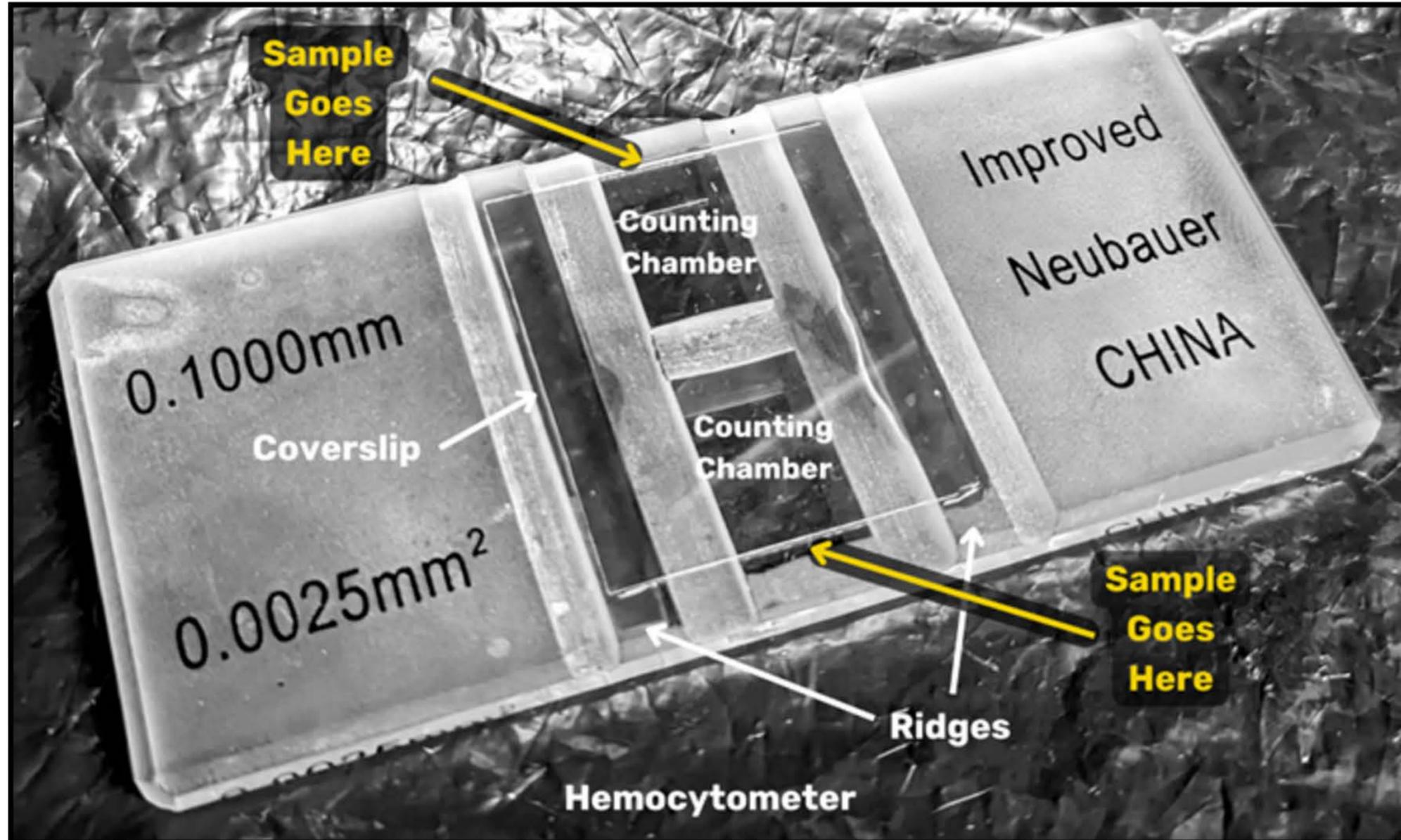
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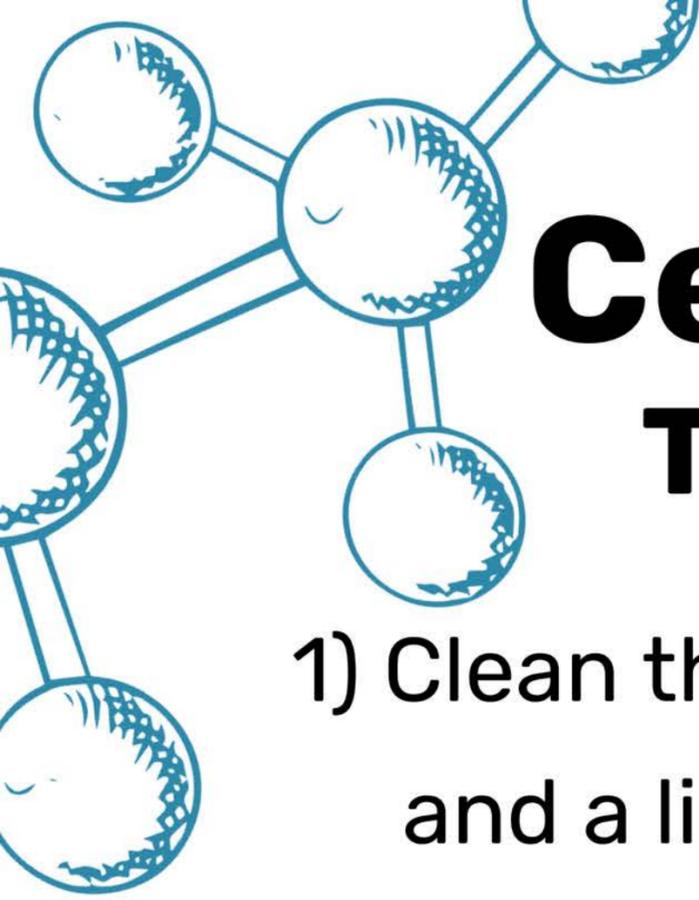
Total magnification

Stage



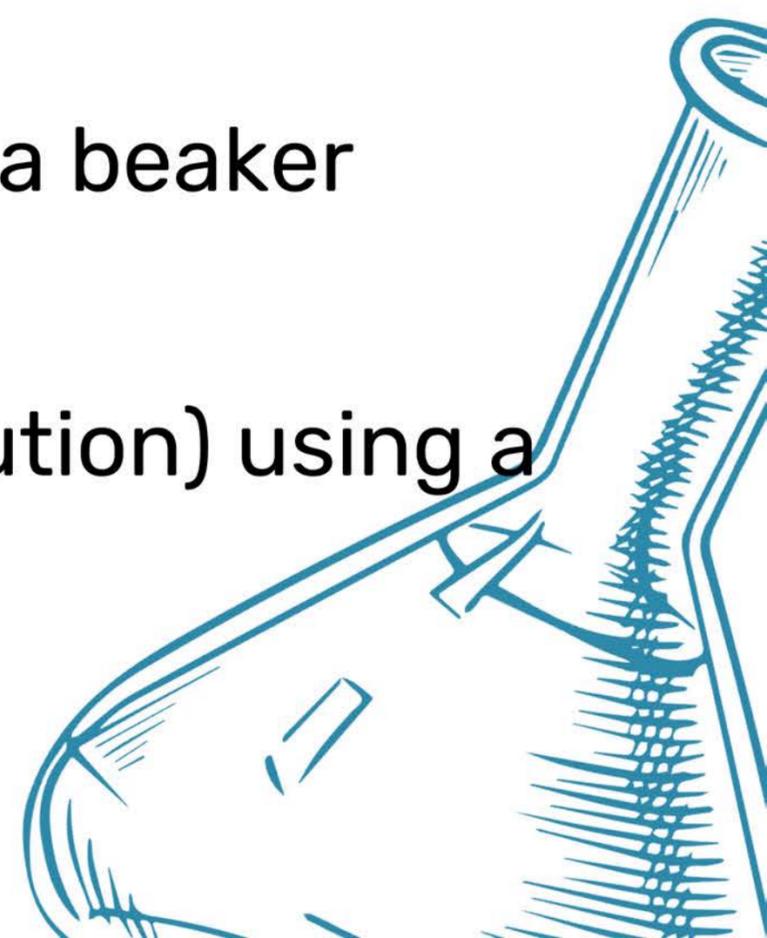
Hemocytometer

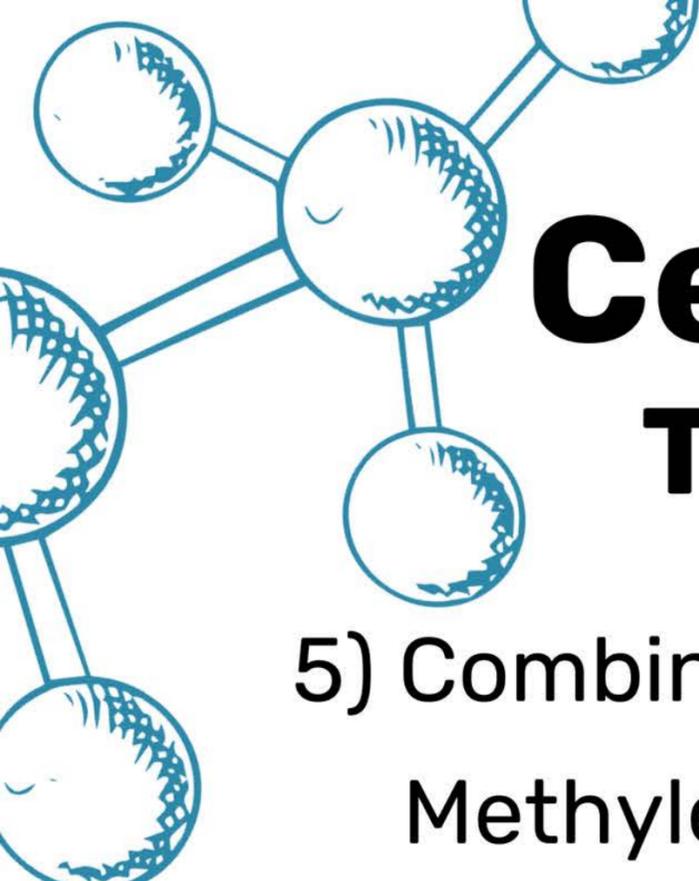


A blue line-art illustration of several yeast cells, some showing internal structures like nuclei and vacuoles, connected by thin lines.

Cell Count & Viability

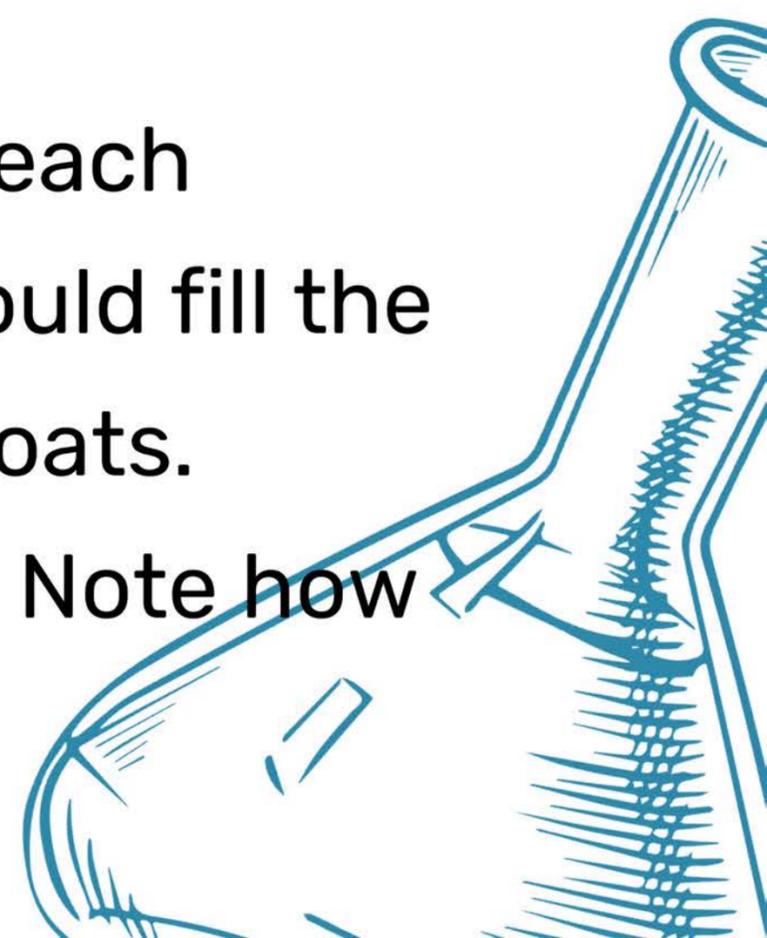
The Steps

- 1) Clean the hemocytometer and coverslip with isopropyl alcohol and a lint-free wipe.
 - 2) Place the cover slip on the hemocytometer.
 - 3) Degas and homogenize 25-50 mL of yeast slurry in a beaker with a stir bar.
 - 4) Transfer 1 mL slurry to 99 mL DI water (100-fold dilution) using a volumetric pipet. Mix with a stir bar for 5 minutes.
- 
- A blue line-art illustration of a volumetric pipet, showing the bulb and the narrow stem with a stopcock.

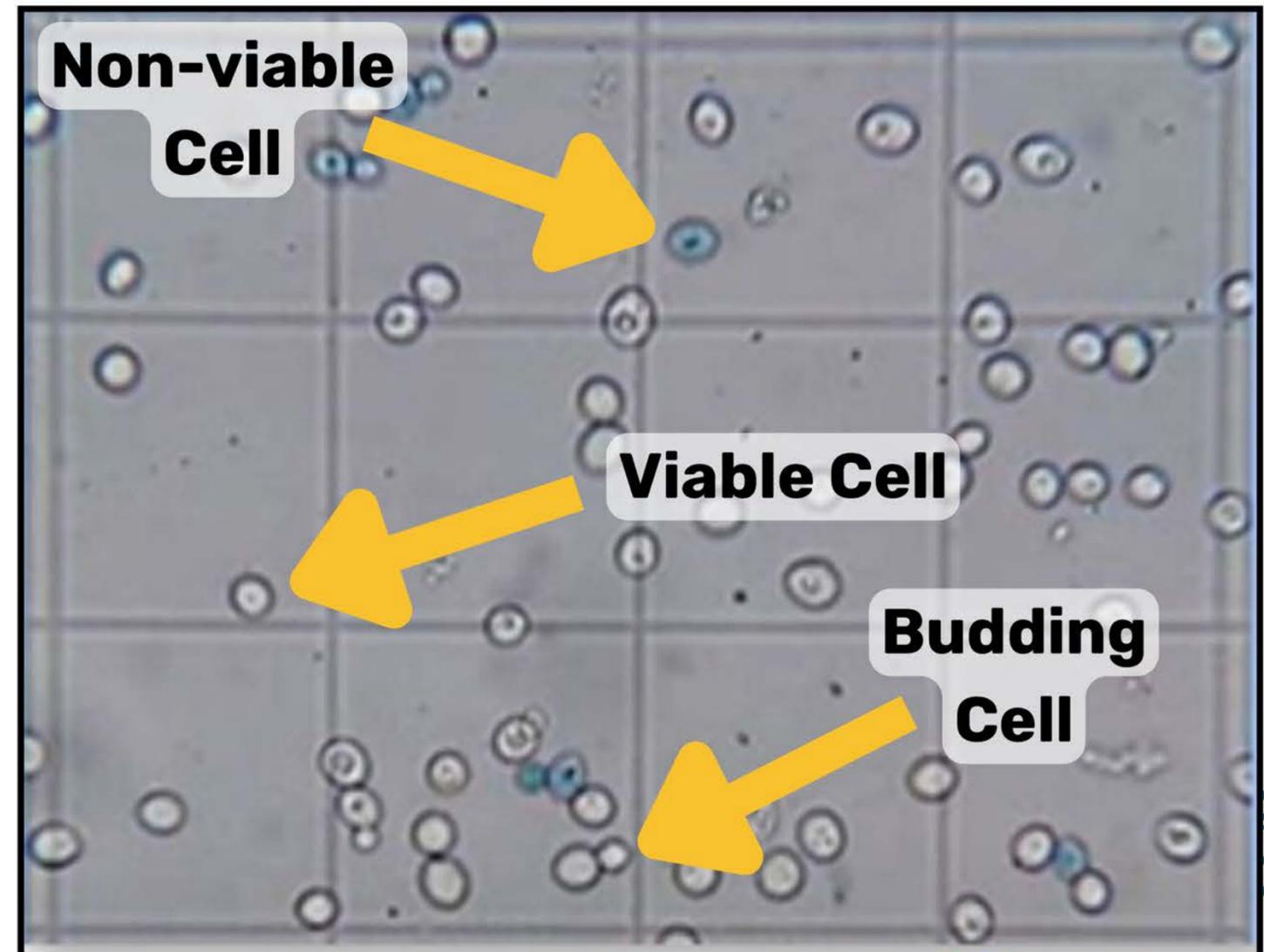
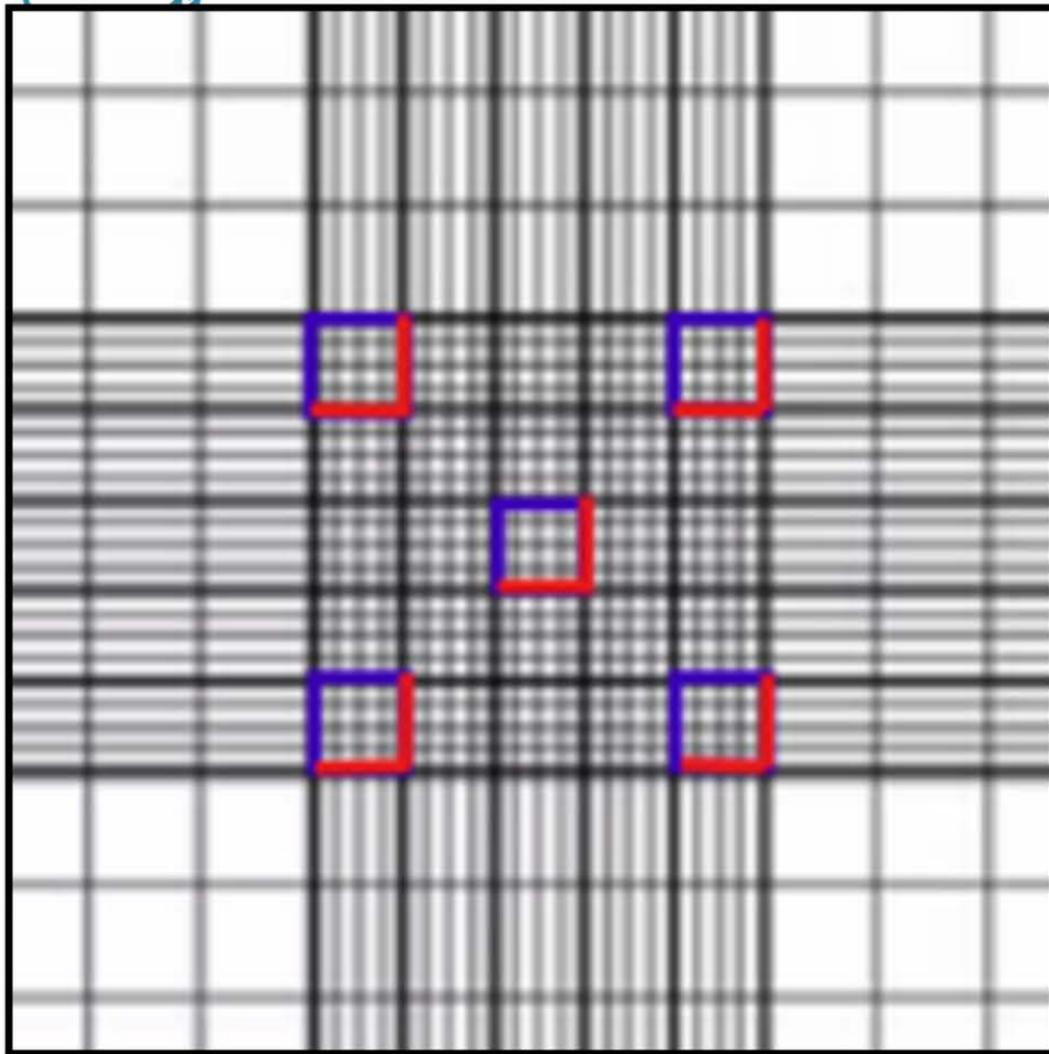


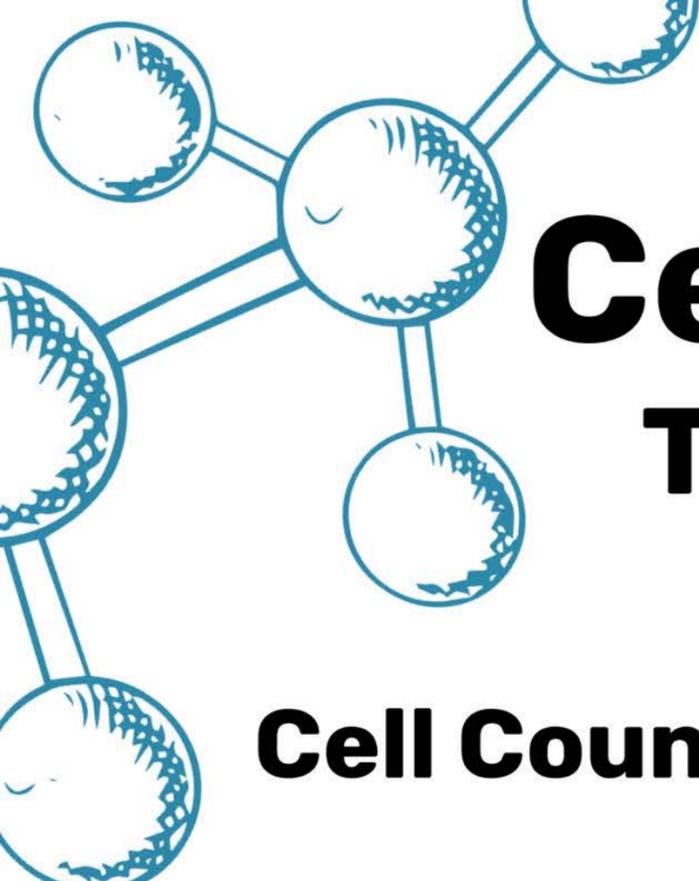
Cell Count & Viability

The Steps

- 5) Combine equal portions of the diluted yeast slurry and 0.01% Methylene Blue (2-fold dilution).
 - 6) Mix gently and let sit ~3 minutes.
 - 7) Using a fine-tipped transfer pipet, place 1 drop into each counting well on the hemocytometer. The liquid should fill the grid platform completely without spilling into the moats.
 - 8) At 400x magnification, count the cells in 5 squares. Note how many are blue.
- 

Cell Count & Viability



A stylized illustration of several interconnected circular cells, some with internal structures, connected by thin lines, located in the top-left corner of the slide.

Cell Count & Viability

The Math

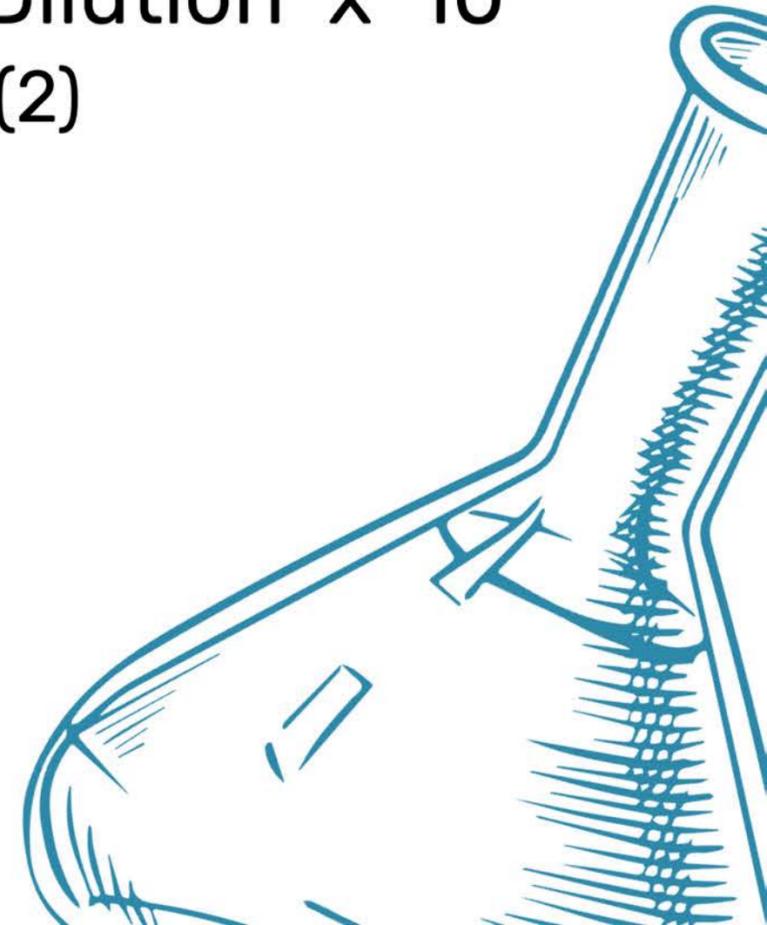
Cell Count:

$$\# \text{ of cells/mL} = \# \text{ Total Cells} \times 5 \times \text{Slurry Dilution} \times \text{Dye Dilution} \times 10^4$$

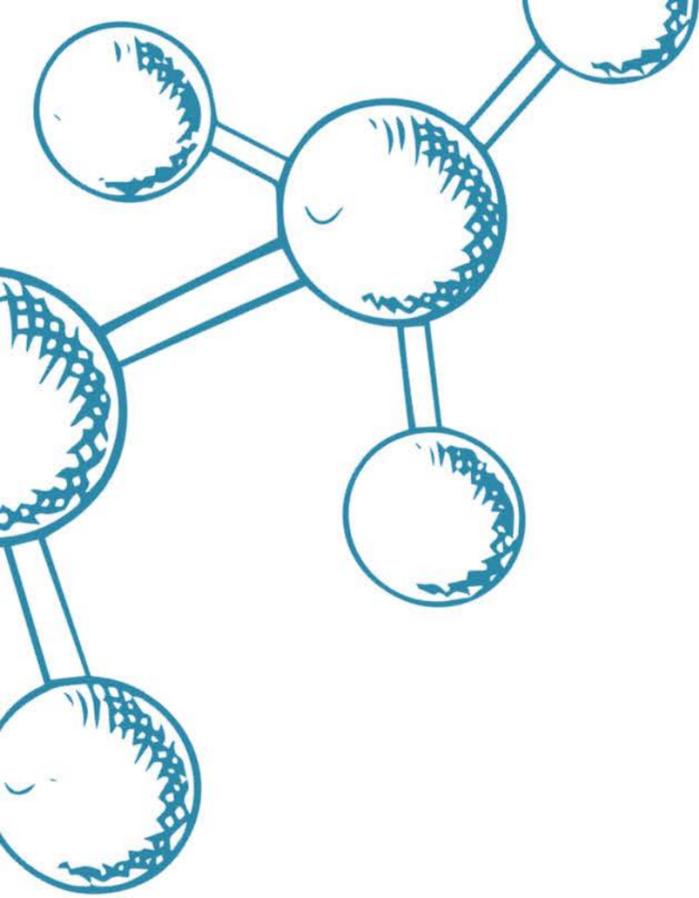
(100) (2)

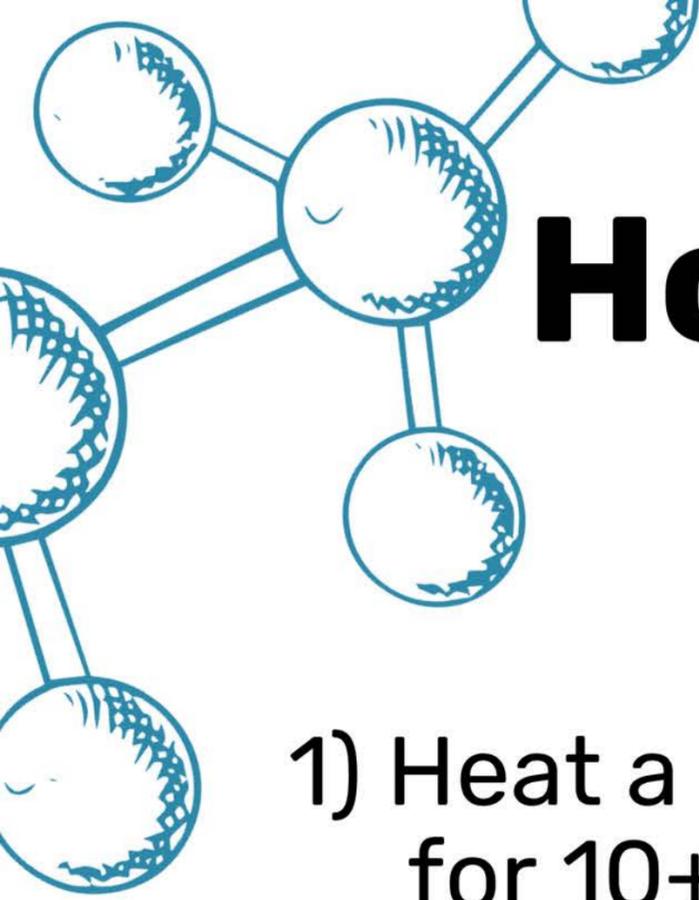
Viability:

$$\% \text{ Viability} = \frac{\# \text{ Viable Cells}}{\# \text{ Total Cells}} \times 100$$



Diacetyl Force Test





Hot Water Bath

Do not boil

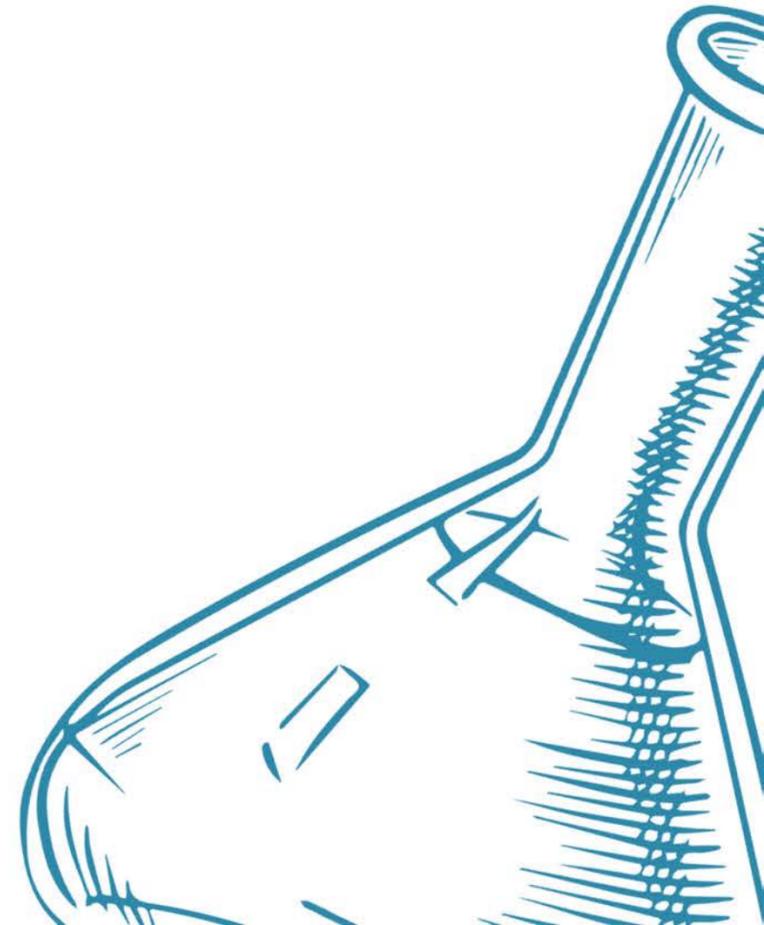
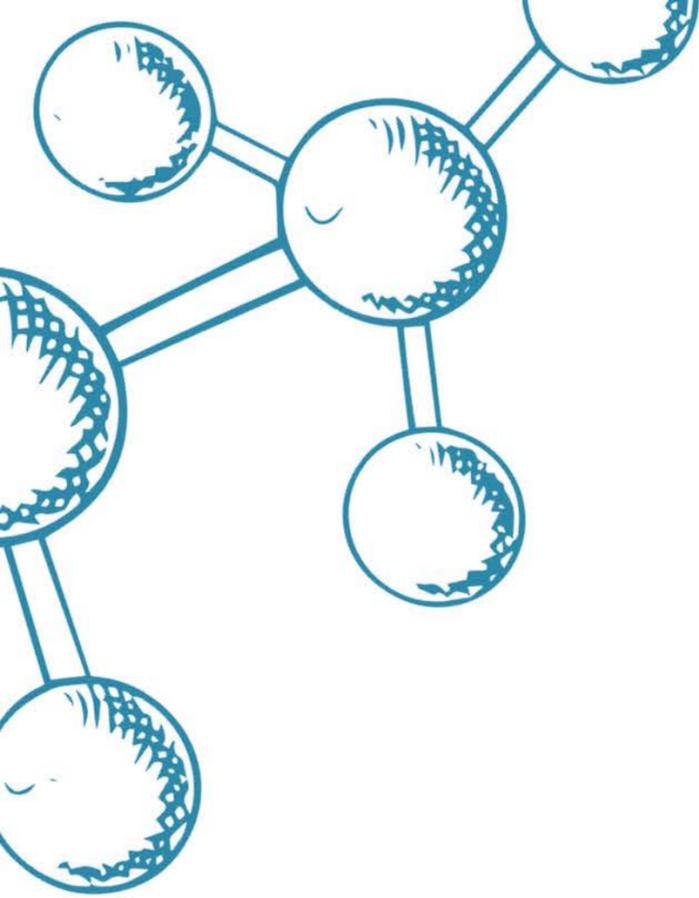
- 1) Heat a sample to 140–160°F/60–70°C for 10+ minutes.
- 2) Optional, cool sample to room temperature.
- 3) Smell for popcorn butter.

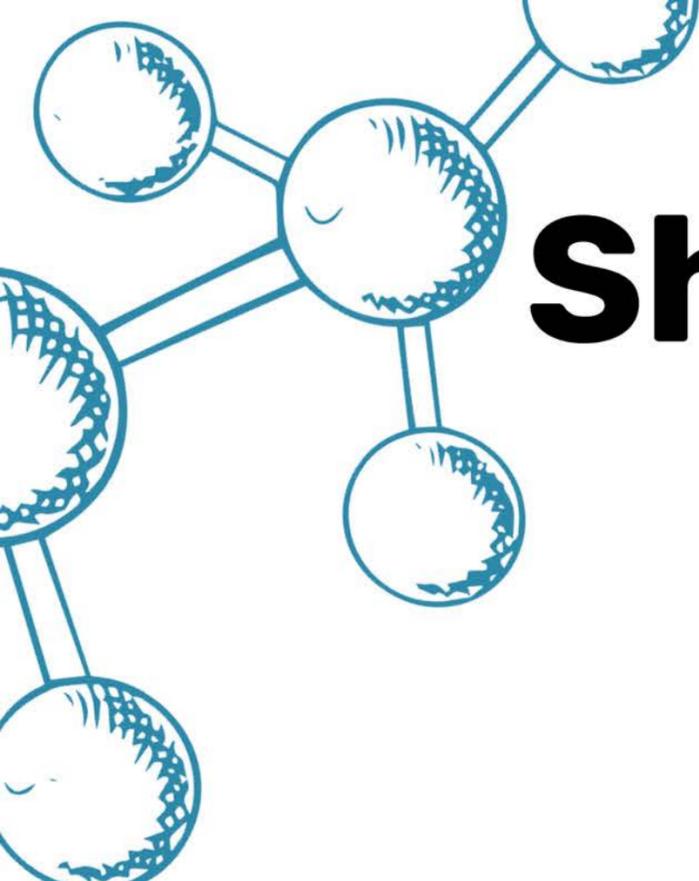
Butter = needs to rest longer ❌

No butter = ready to crash ✅



Shelf Stability



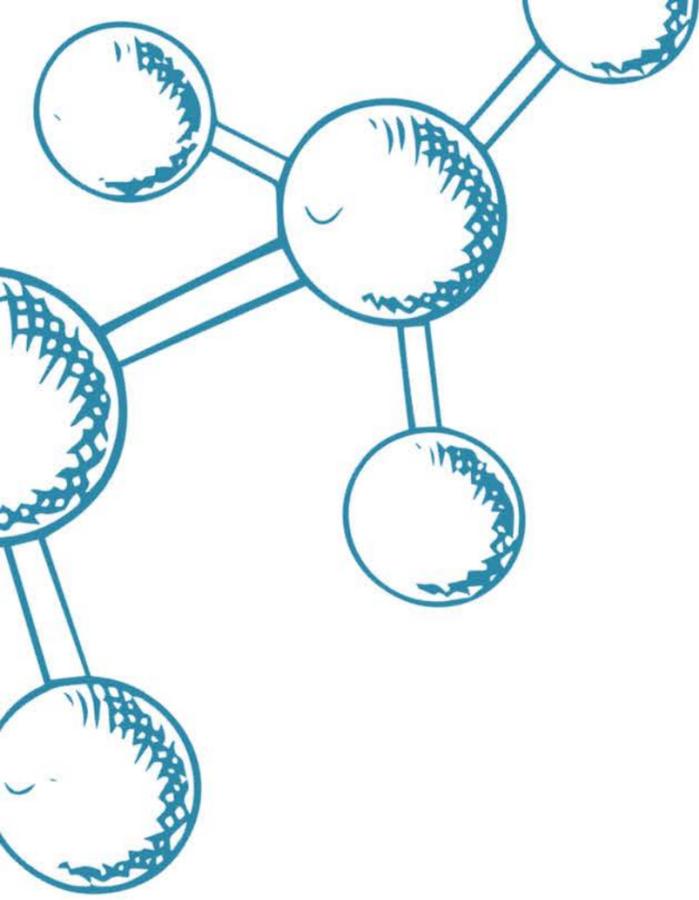


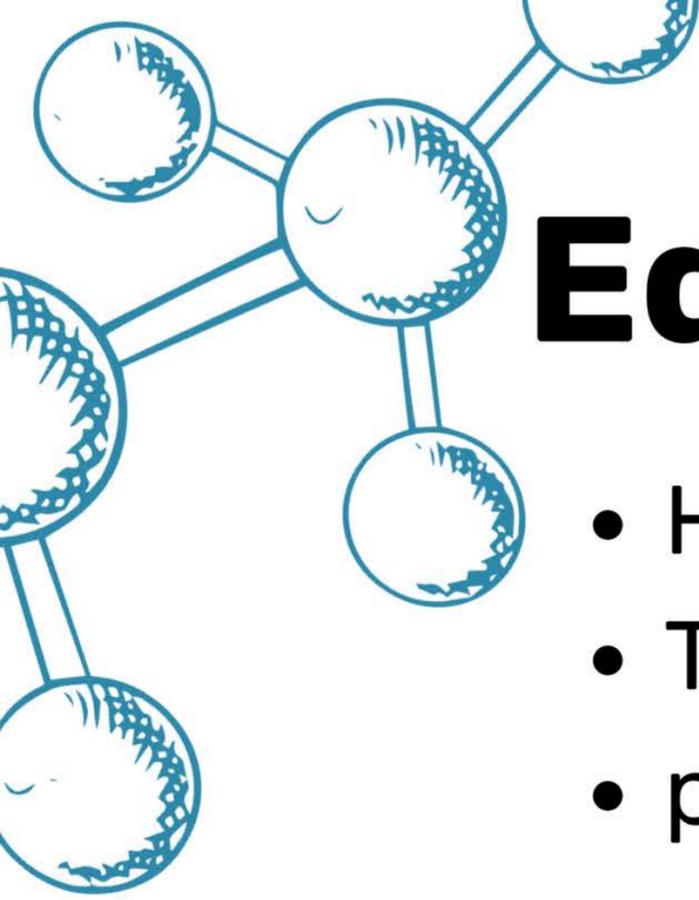
Shelf

Reserve samples of each packaging run for analysis should issues arise in the market.

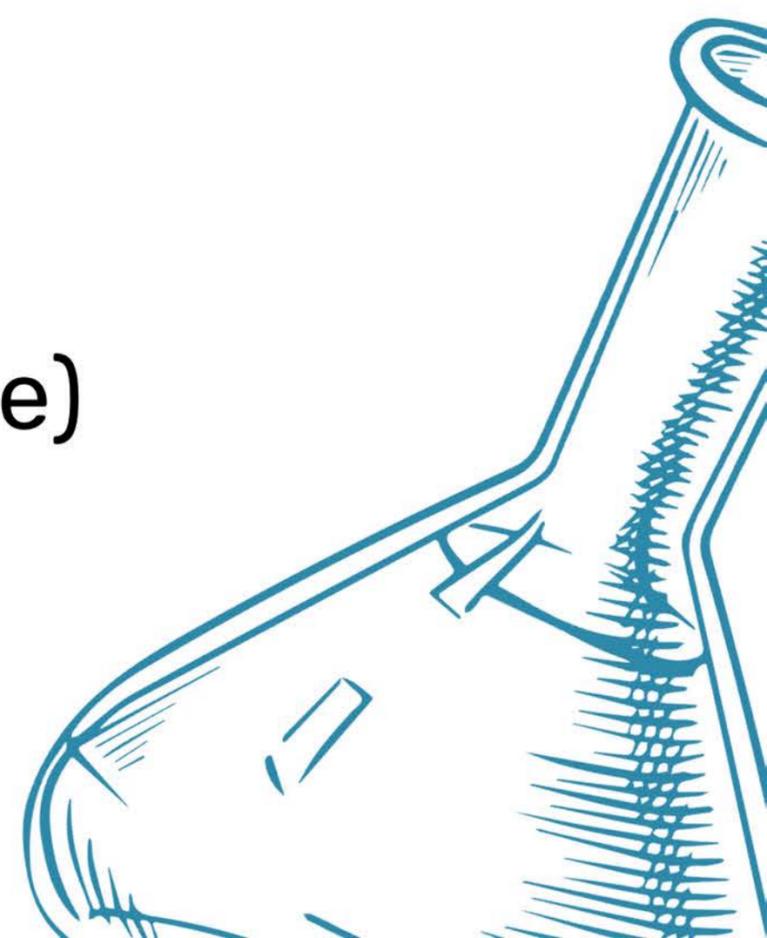


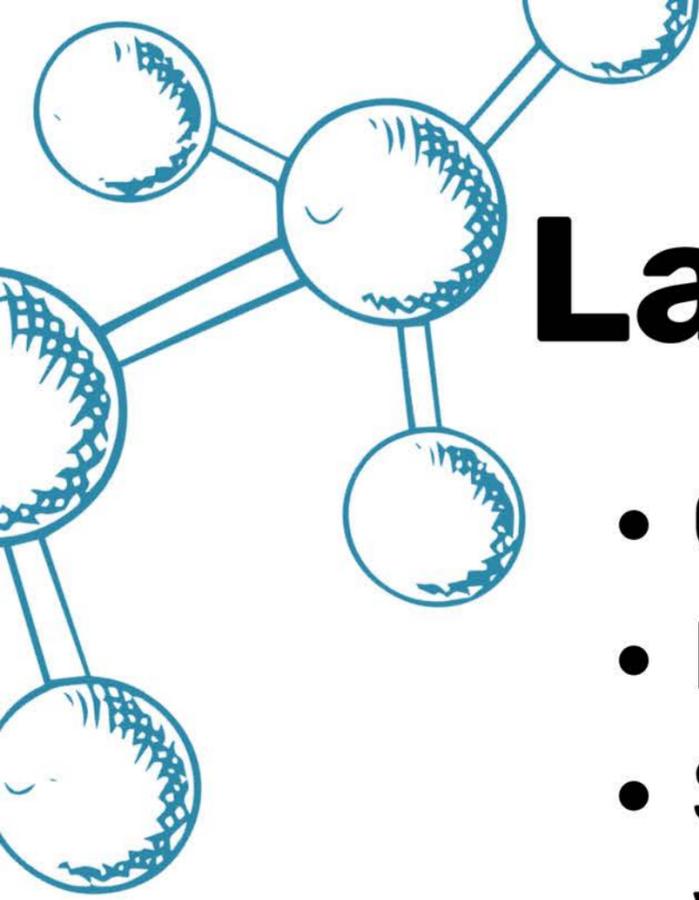
Shopping Lists



A blue line-art illustration of a molecular structure, consisting of several interconnected circles of varying sizes, some with internal patterns, representing atoms or molecules.

Equipment

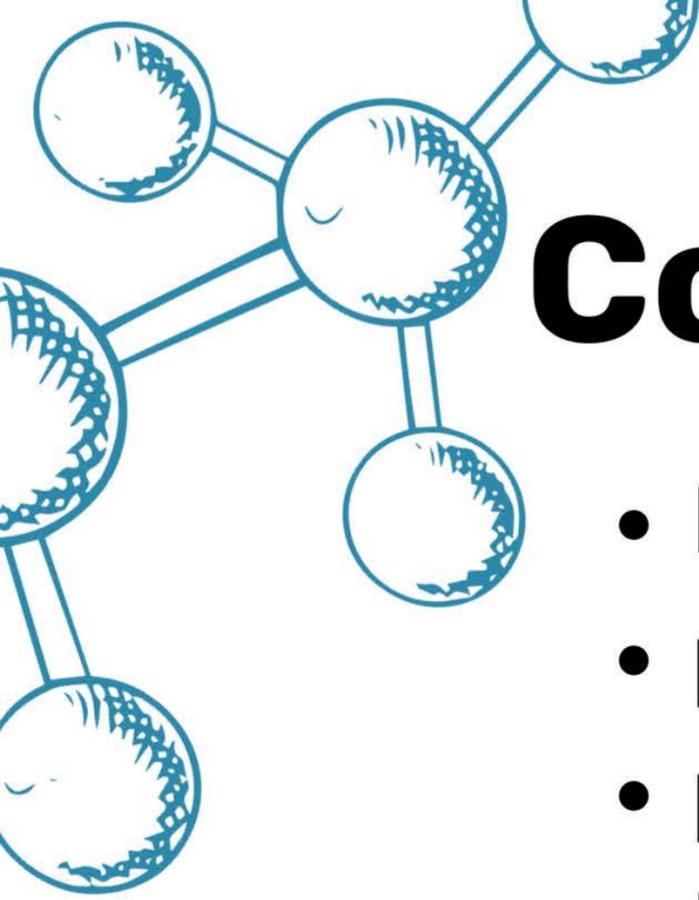
- Hydrometer or Density Meter
 - Thermometer
 - pH Meter
 - pH Electrode
 - Stir Plate
 - Microscope
 - Hemocytometer (improved Neubauer-style)
 - Hemocytometer Cover Slip
 - Hot Water Bath
 - Shelf
- 
- A blue line-art illustration of a microscope, showing the eyepiece, objective lenses, and the base of the instrument.

A blue line-art illustration of a molecular structure, consisting of several interconnected spheres of varying sizes, representing atoms, connected by lines representing chemical bonds. The structure is positioned in the upper left corner of the slide.

Labware

- Graduated Cylinder, 100 mL
- Beakers, 100 mL
- Stir Bars
- Volumetric Pipet, 1 mL
- Clicker Counter, optional
- Calculator



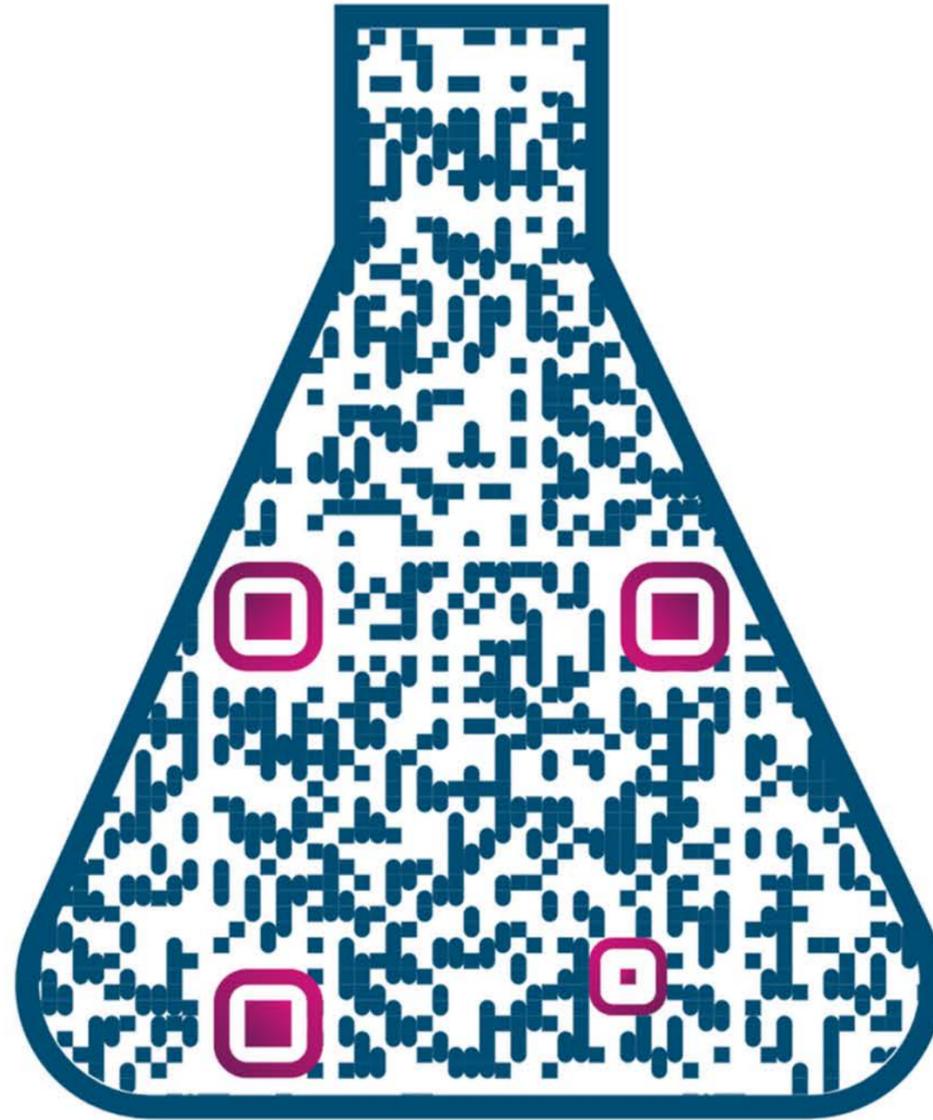
A stylized blue line drawing of a molecular structure with several interconnected spheres and lines, located in the top-left corner of the slide.

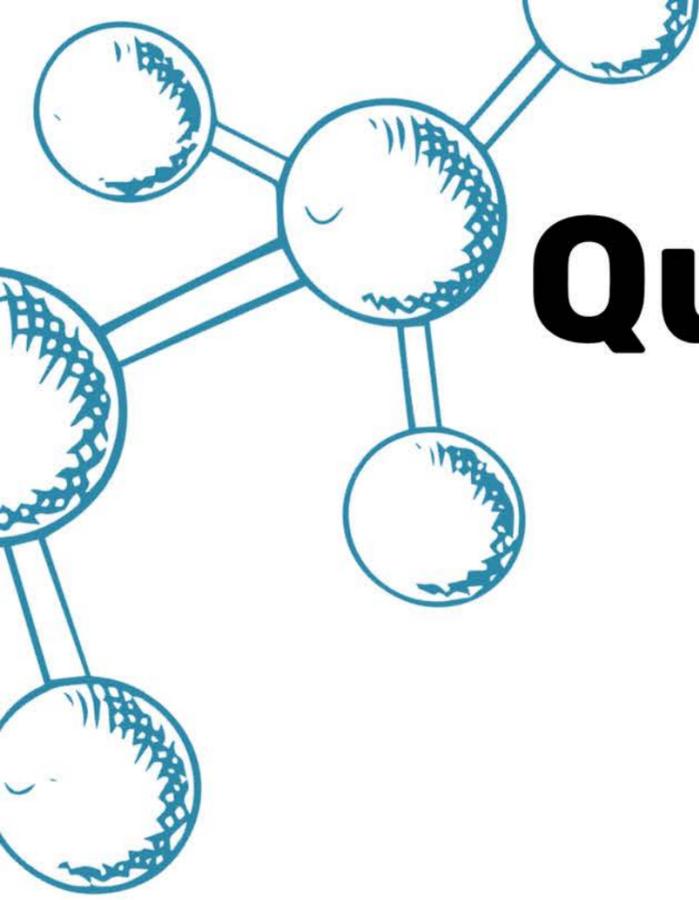
Consumables

- DI water
- pH Buffers, (4, 7, 10)
- pH Storage Solution (3.5M KCl)
- Methylene blue, 0.01%
- Isopropanol
- Transfer Pipet, thin tip
- Lint-Free Wipes (eg. Kim wipes)
- 50 mL centrifuge tubes



Printable Lab List

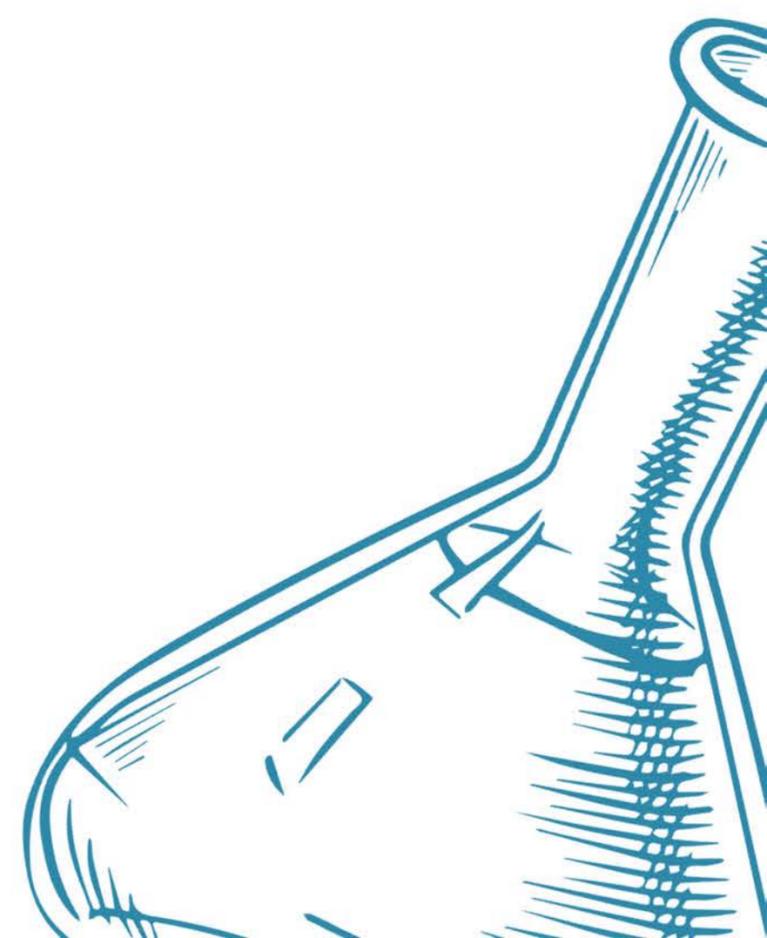


A blue line-art diagram in the top-left corner shows a central node connected to several other nodes, some of which are further connected to others, forming a network structure.

Questions?

Contact Information

Audrey Skinner
Audrey@Imbibe-Solutions.com

A blue line-art illustration in the bottom-right corner shows a cocktail shaker with a lid, tilted as if being shaken.