IMBIBE SOLUTIONS

Setting Up A Small-Scale QC Lab

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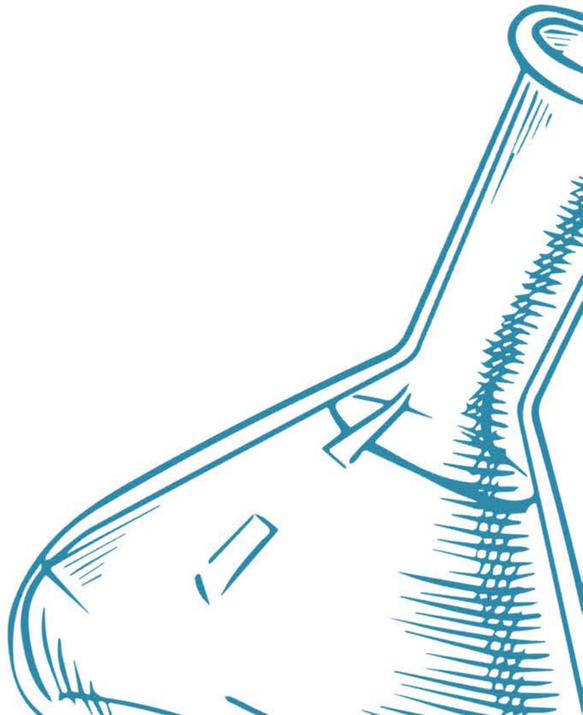
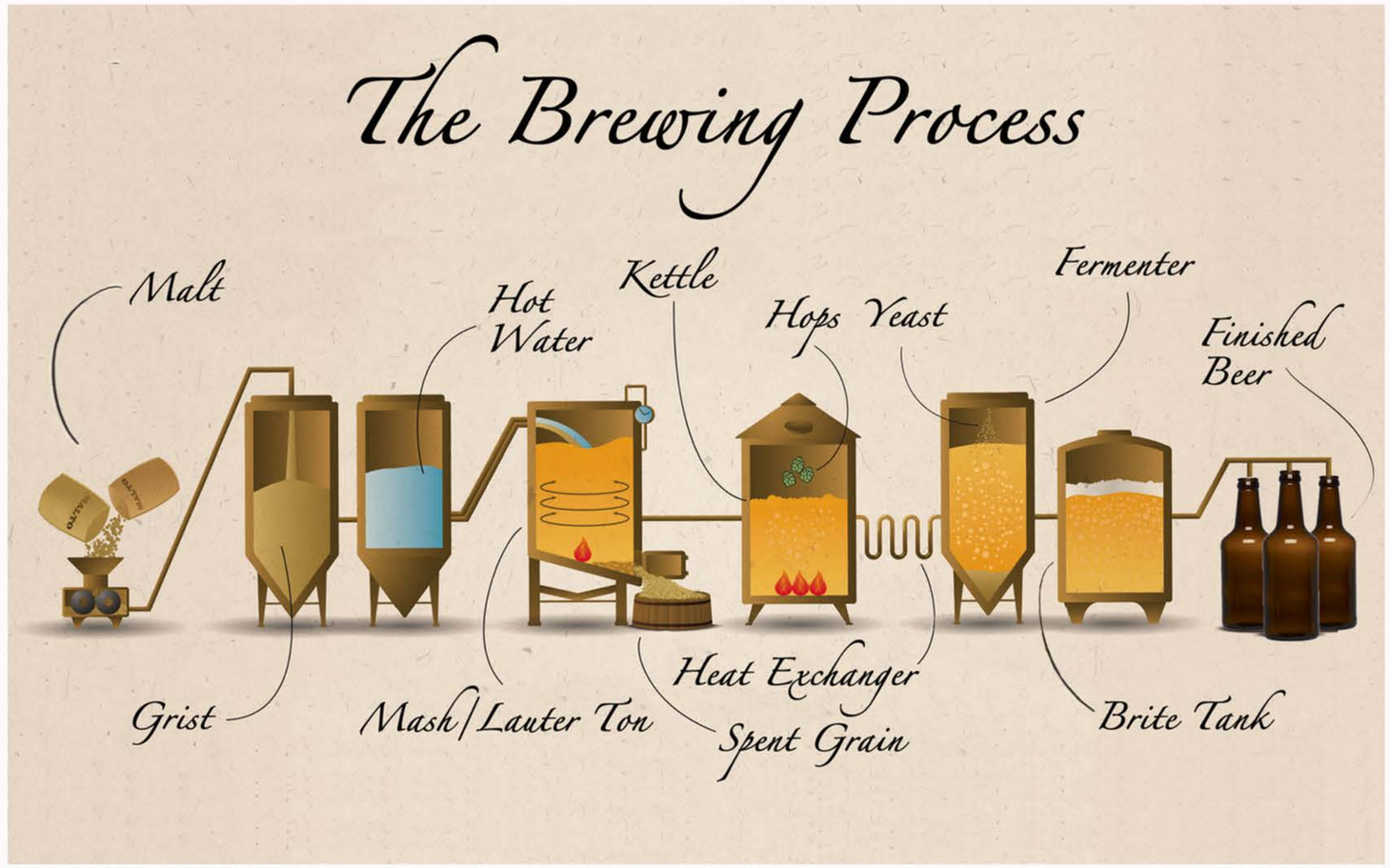
NanoCon 2025



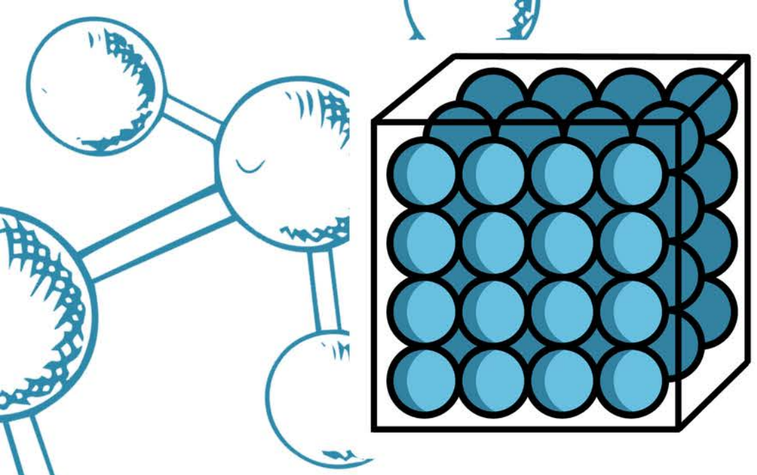
Why is quality control important?

Goal: Make sure each batch meets specifications.

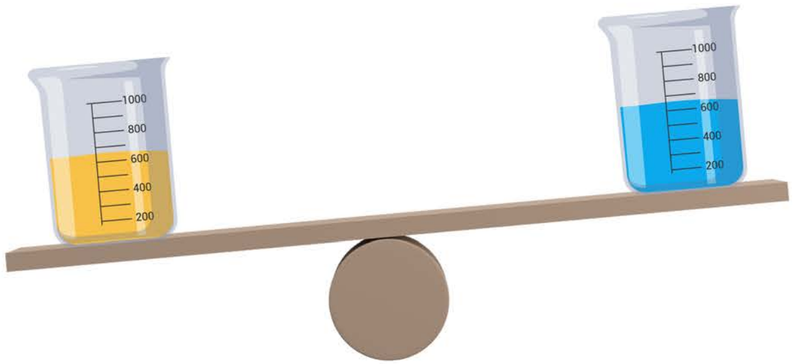
Is it good?


The Brewing Process
Malt
Hot Water
Kettle
Hops
Yeast
Fermenter
Finished Beer
Grist
Mash/Lauter Ton
Heat Exchanger
Spent Grain
Brite Tank

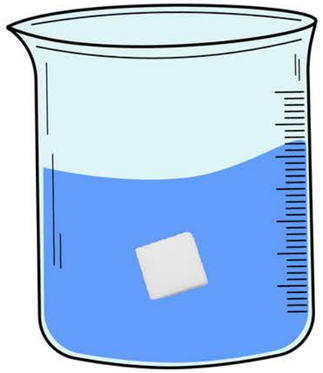
Original & Final Gravity



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



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



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

Hydrometer

Measures density via buoyancy

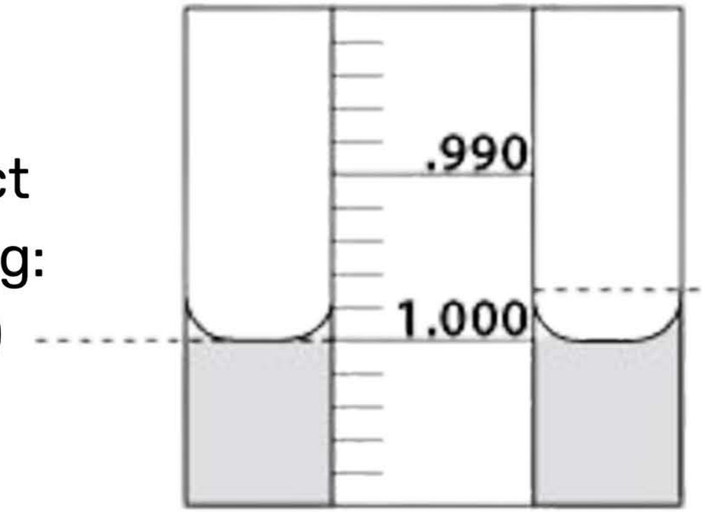
Pros

- 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

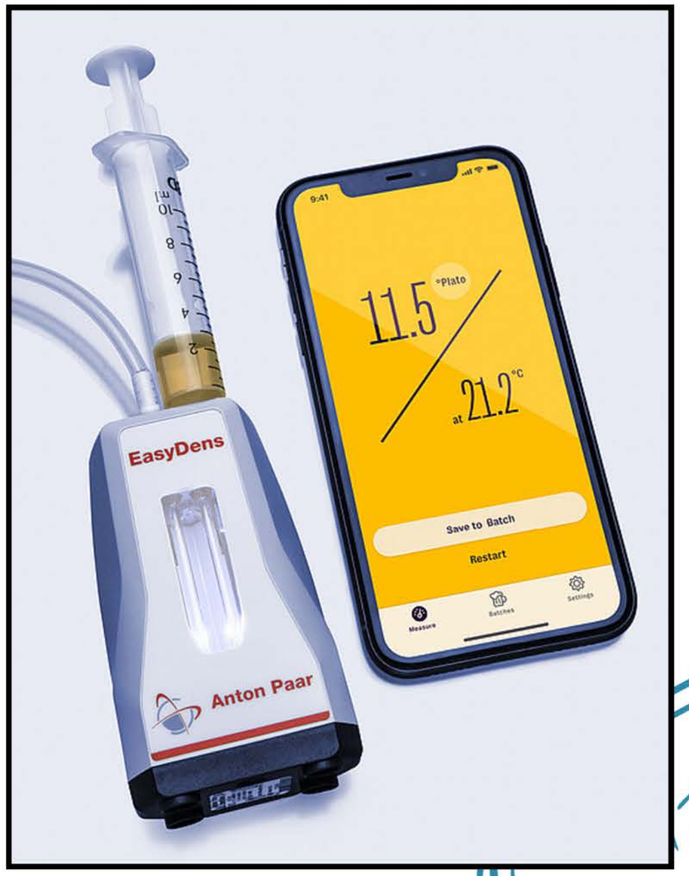
Measures density via U-tube principle

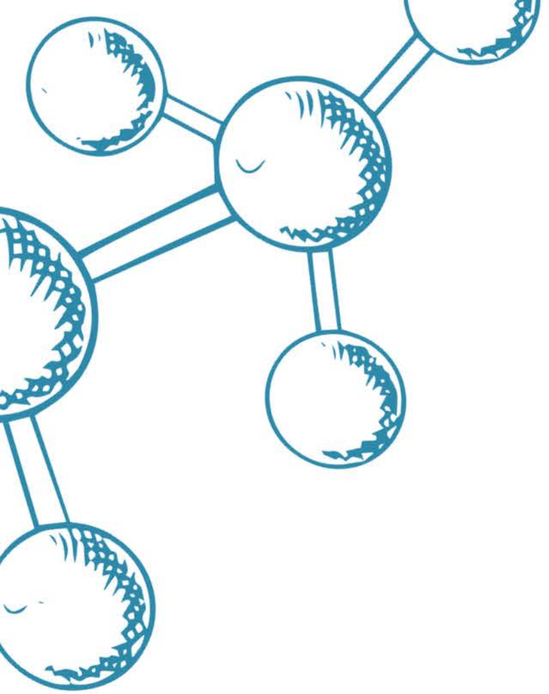
Pros

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

Cons

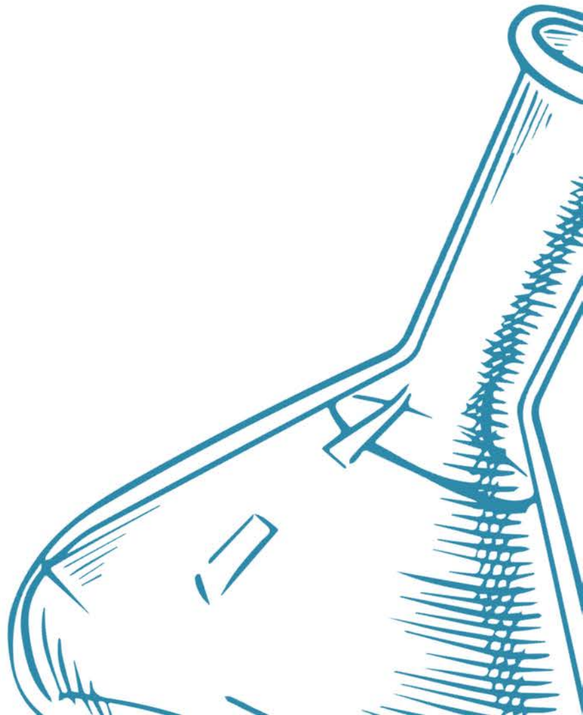
- Cost: ~$500





IMBIBE SOLUTIONS

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 occured.

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

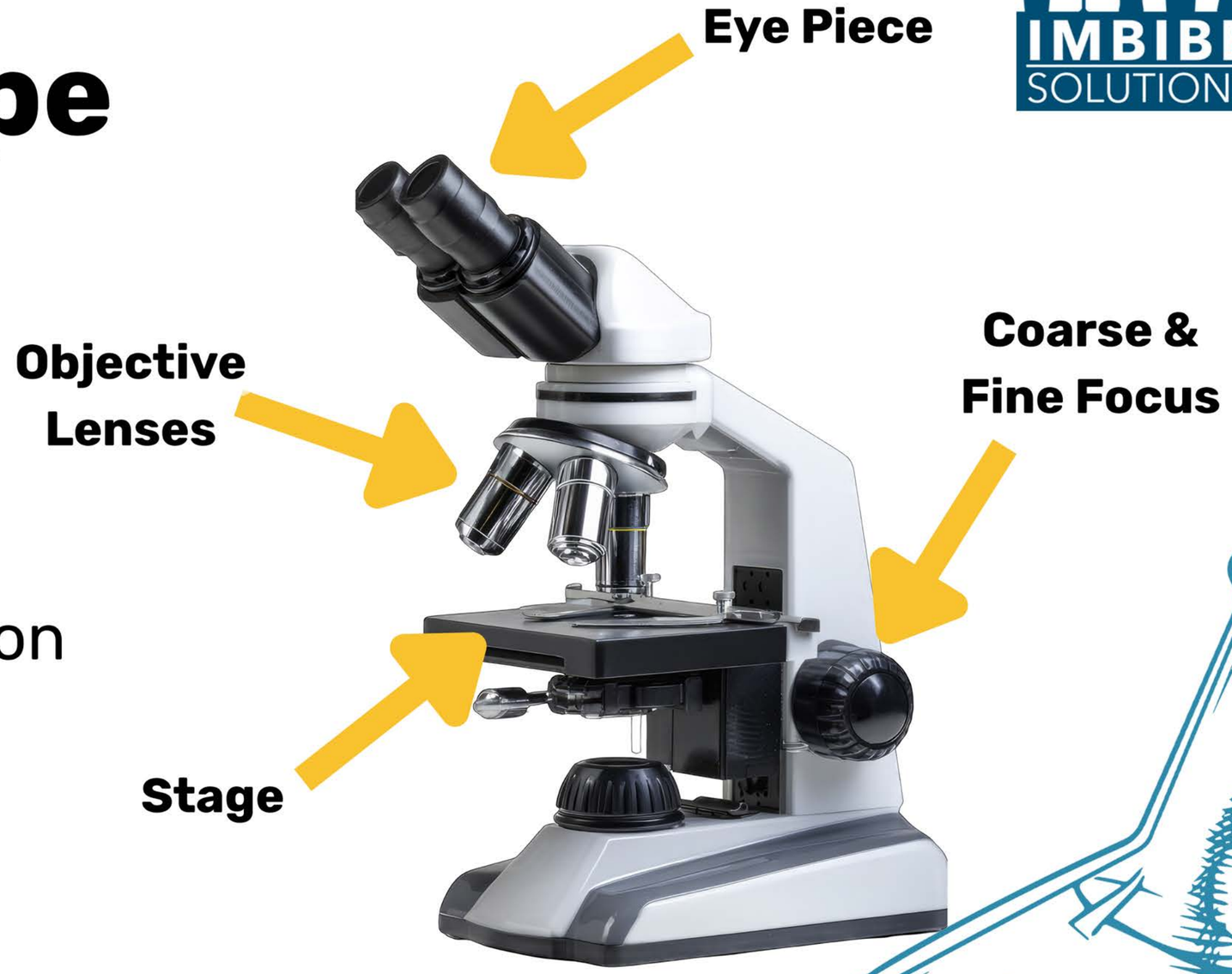
pH Electrode: Care

- 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.

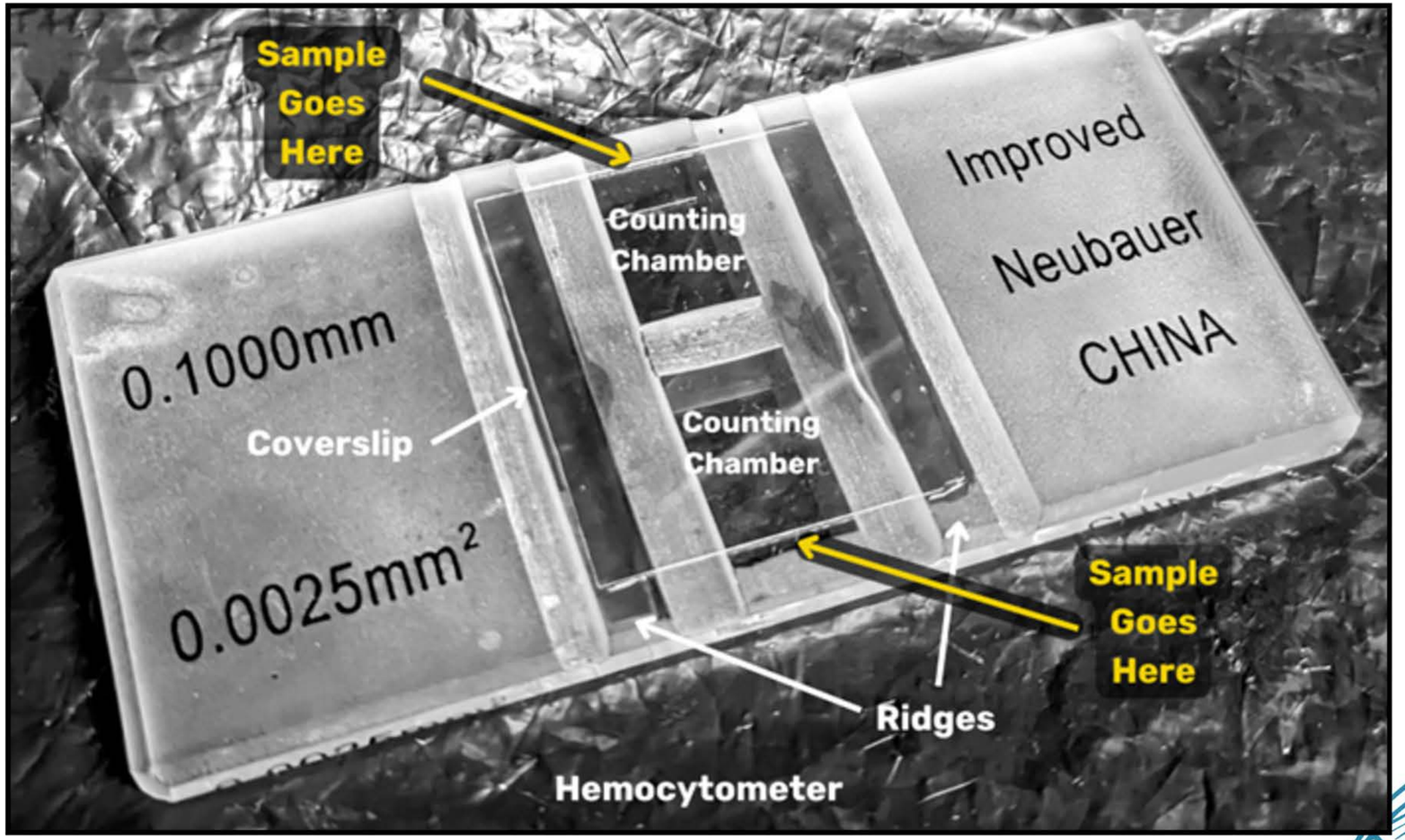
Cell Count & Viability

Microscope

Eye Piece magnification
x
Objective Lense magnification
=
Total magnification



Hemocytometer



Cell Count & Viability

The Steps

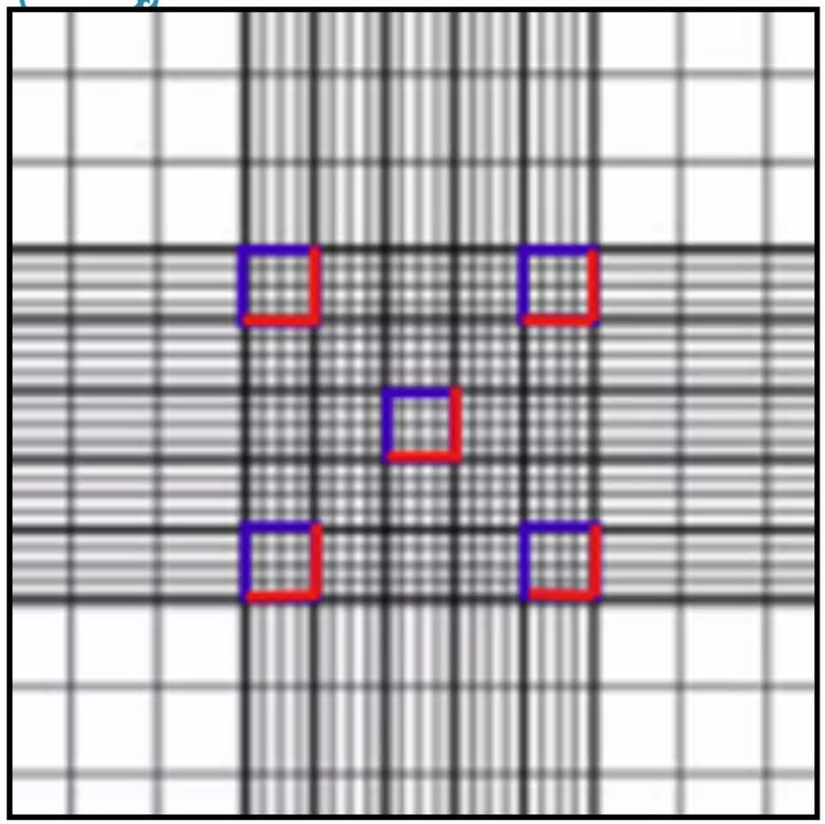
1) Clean the hemocytometer and coverslip with isopropyl alcohol and a lint-free wipe.
2) Place the cover slip on the hemocytometer.
3) Degas and homogenize 25-50 mL of yeast slurry in a beaker with a stir bar.
4) Transfer 1 mL slurry to 99 mL DI water (100-fold dilution) using a volumetric pipet. Mix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

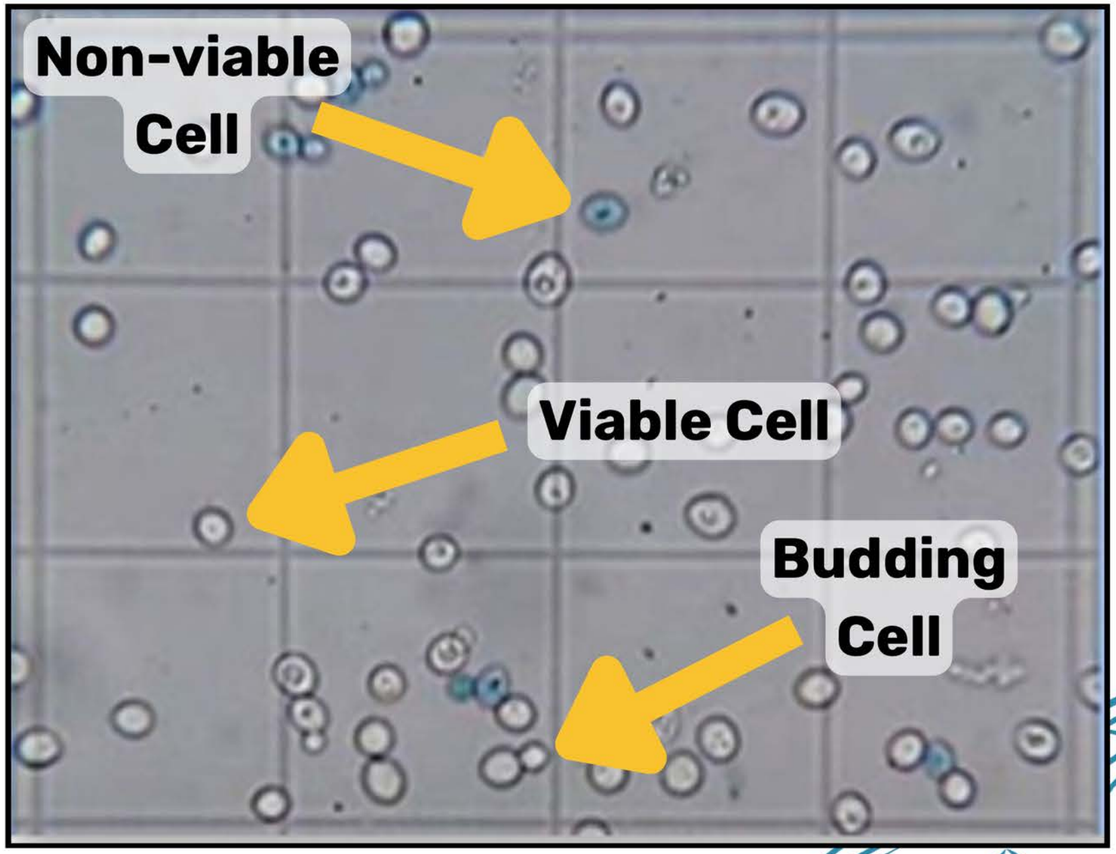
Cell Count & Viability

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





Cell Count & Viability

The Math

Cell Count:

$$\#\ \text{of cells/mL} = \#\ \text{Total Cells} \times 5 \times \underset{(100)}{\text{Slurry Dilution}} \times \underset{(2)}{\text{Dye Dilution}} \times 10^{4}$$

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

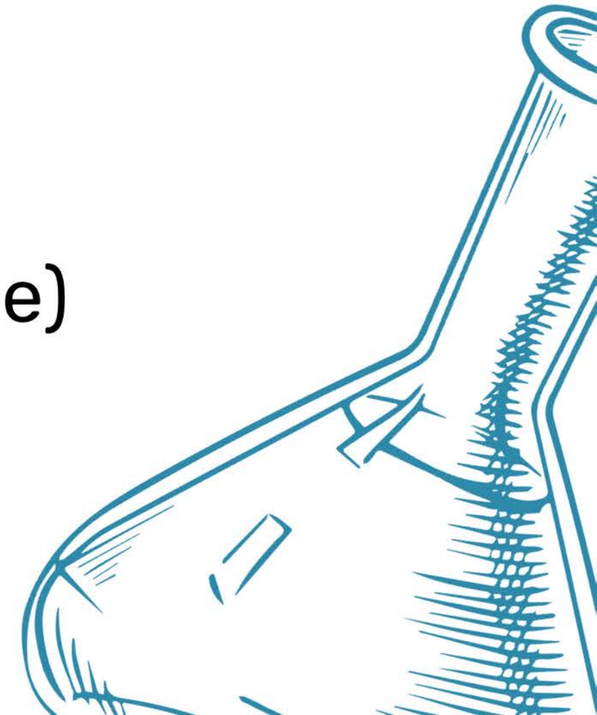
Shelf

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

Shopping Lists

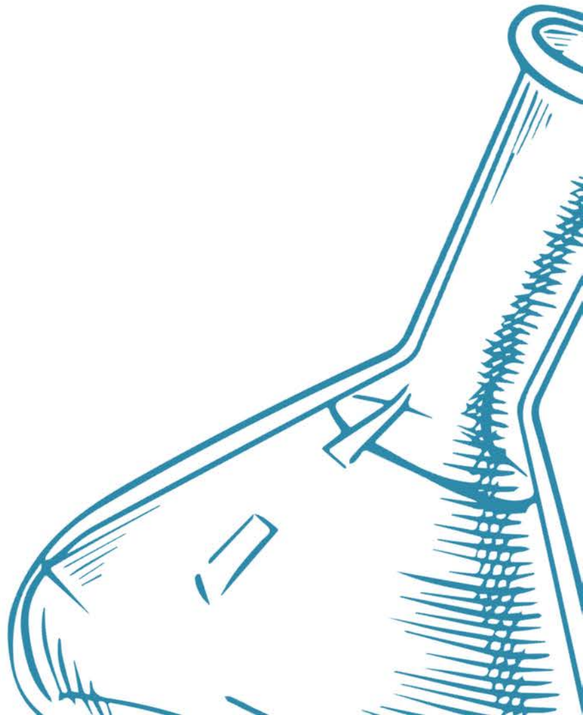
Equipment

- Hydrometer or Density Meter
- Thermometer
- pH Meter
- pH Electrode
- Stir Plate
- Microscope
- Hemocytometer (improved Neubauer-style)
- Hemocytometer Cover Slip
- Hot Water Bath
- Shelf



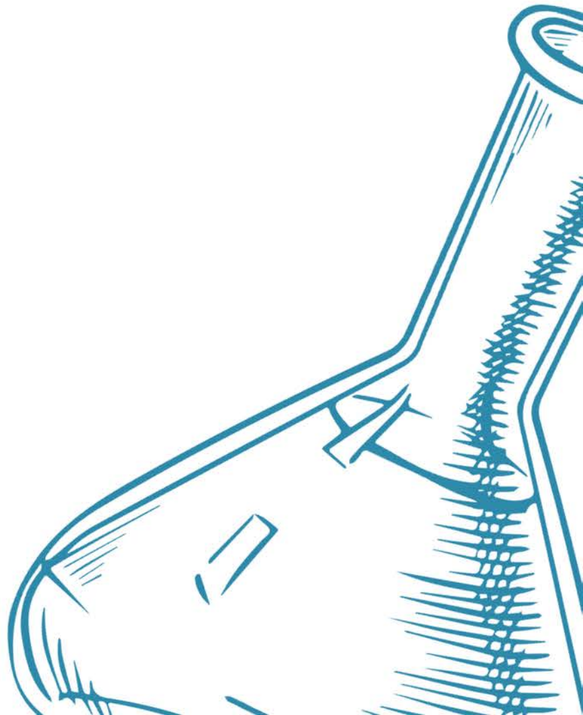
Labware

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

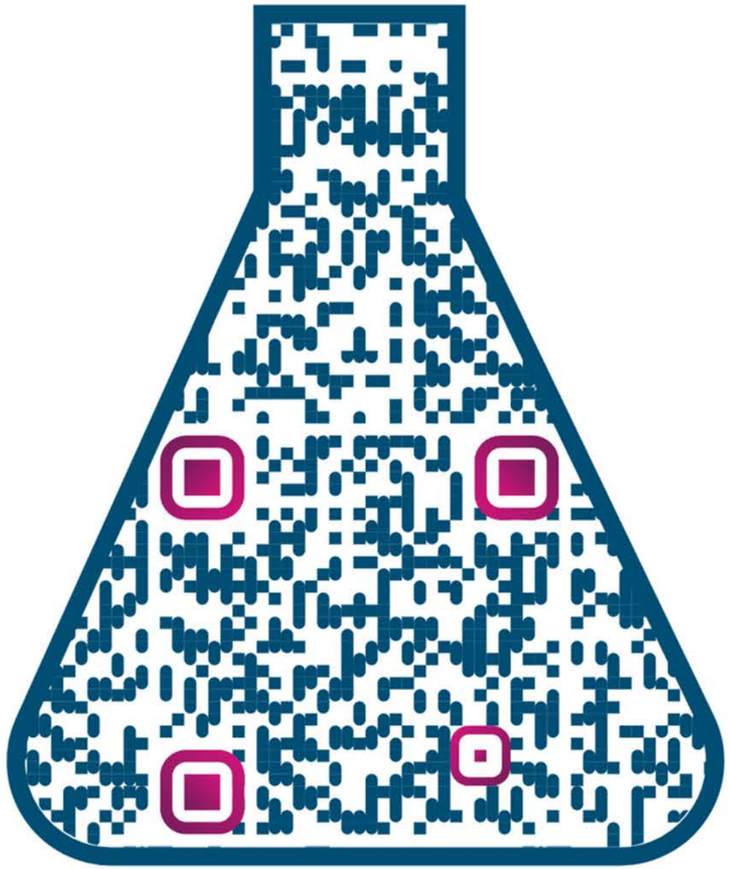


Consumables

- 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



Questions?

Contact Information

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