



GigaYeast, Inc.
2526 Qume Dr #21 San
Jose CA 95131
(669) 342-7757
Info@GigaYeast.Com

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Suggested equipment for your brewery lab (June 2018)

Microscope

Suggested items: Compound light microscope with 10X, 40X and 100X objectives.

What's it for? You will need a microscope for enumerating and estimating yeast viability and for examining beer, wort, slurry, and other samples.

NOTES: Designate an area where the microscope will be used. Plan on a 3' by 3' flat surface with a 110 outlet nearby and a chair that allows you to sit while using it. It is nearly impossible to use a scope standing. Make sure it is out of harm's way—i.e. not in a place where it will get knocked over or sprayed with H₂O etc. etc.

For examining beer/slurry, performing cell counts and viability checks you need a compound light microscope with 10X, 40X and 100X objectives. Scopes come in as many grades and price levels as cars. There are inexpensive brands like AmScope that sell compound scopes for as little as \$200. I have used these several times at breweries and they function well enough to get the job done. That being said, I find it nearly impossible to get the same quality image as on a Nikon, Leitz, Zeiss or Olympus. Of course, these higher end scopes will start at \$1,500 and go up from there. As a more affordable alternative you can find these high-end scopes used or refurbished for \$400 to \$1,000 and get a much better image than a brand new \$200 model.

Some suggested models (this is far from a complete list): Olympus CX22 for app. \$1,500, AmScope 40X-2500X 1W LED Vet Binocular Compound Microscope \$600.00 (\$299 on sale).

Microscope Accessories:

Suggested items: Glass slides, cover slips, a Hemocytometer and immersion oil for a 100x objective

What's it for? You will need a few accessories to view samples and enumerate yeast on your microscope. Glass slides and cover slips are required for mounting samples for general microscopic observation. Immersion oil is required for observation with 100x objectives (the oil matches the refractive index of glass and provides a clear image at high magnification). A hemocytometer is required for yeast enumeration and viability. Choose either a glass hemocytometer that can be cleaned and re-used or disposable plastic hemocytometers (handy if you are doing several counts per day).



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NOTES: Choose plain glass slides that are 25mm x 75mm x 1mm and square cover slips that are 22mm x 22mm x .17-.25 mm. Glass hemocytometers range in price from \$50-\$200. Beware of very cheap hemocytometers as they can be inaccurate. Whatever you choose, get a Neubauer improved grid with sample loading ports. Disposable hemocytometers are useful if you are doing a lot of counts. C-chip is the most popular brand and typically costs app. \$1.00 per count. Many companies including Fisher scientific sell glass slides, cover slips and hemocytometers. Amazon also has a surprising amount available. Shop for the best prices!

Pipettes

Suggested items: Micropipettes and sterile serological pipettes

What's it for? A pipette is a device used to dispense liquid in measured volumes. To take samples, make dilutions and load small samples onto glass slides or hemocytometer you will need various pipettes in your brewery lab.

Micropipettes dispense small amounts of liquid measured in microliters (1,000th of a milliliter). Three micropipettes with a range of 1-20 microliters (P-20), 20-200 microliters (P-200) and 100-1,000 microliters (P-1,000) is ideal. Alternatives include a P-20 and disposable glass Pasteur pipettes (much cheaper) used in conjunction with a scale for dilutions or even just glass Pasteur pipettes with a scale.

Sterile, disposable serological pipettes of 5ml and 10ml volumes plus a pipette filler are required for sampling and dispensing precise volumes without contamination.

Notes: There are many brands and models of micropipettes. Choose a simple, single channel model with adjustable volumes such as a Gilson Pipetman for \$150-\$300 each at Pipettes.Com depending on sales. Serological pipettes should be made of plastic and gamma irradiated for sterility. Search for the best price and expect to pay between \$35 and \$50 per pack of 50. Choose a simple bulb or thumb wheel filler that is capable of dispensing 10mls (expect to pay \$10 - \$40).

Measuring devices

Suggested items: Autoclavable Pyrex bottles with graduated markings (1,000ml, 500ml and 100ml), Graduated Beakers and cylinders (100ml, 250ml, 500 and 1,000ml) and a Scale (a balance that measures between .1g and 200g is a good starting point unless you will be making your own agar media in which case a scale from 0.1 to 1,000 g is more efficient)

What's it for? Virtually any lab program will require you to accurately measure and transfer accurate volumes for examination, dilutions etc.



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Notes: Bottles are useful for measuring and storing samples. Cylinders and beakers allow you to dispense accurate volumes of liquid. A scale allows you to accurately estimate volumes by mass - particularly important if you are trying to measure volumes of yeast slurry that have a significant amount of gas in them.

Glass culture tubes and Shaker Flasks

Suggested items: 250ml shaker flasks, 1 L shaker flasks and glass test tubes. Erlenmeyer flasks with foam stoppers and aluminum foil closures are an affordable alternative for many breweries.

What's it for? Performing forced wort, forced fermentation tests and culturing microbes.

Notes: Shaker flasks and glass test tubes are used for culturing microbes in a shaking incubator, on a magnetic stir plate or stationary. They come with a wide variety of closures including vented and simple two position. Foam stoppers or aluminum foil can also be used as closures. Baffled flasks provide better aeration during shaking but will be problematic on a stir plate as the baffles interfere with the stir bar. Simple Erlenmeyer flasks with a foam stopper and aluminum foil are an affordable substitute for most breweries.

Flame

Suggested items: Bunsen burner plumbed to natural gas or propane or an alcohol lamp

What's it for? You will need a flame for creating a small sanitary work area and for flaming off inoculation loops.

Notes: A flame creates an updraft in a small area by heating air and reducing the density causing it to rise. Working carefully in this area allows a brewer to avoid incidental contamination from airborne particles. A flame is also required for heating inoculation loops and plate spreaders if you will be using agar plates for testing and culturing. Bunsen burners create a stronger flame but require either liquid propane or natural gas. Cheap alcohol lamps work well and burn denatured alcohol available at most hardware stores that sell painting supplies.

Plate Spreader

Suggested items: Stainless plate spreader for microbiology or a length of 1/8" glass rod bent over flame to make your own.



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What's it for? Necessary if your lab program will be testing samples for biological contamination using agar plates.

Notes: Plate spreaders are shaped like a Hockey stick and allow the user to evenly spread samples on agar plates for microbial QC.

Culture agitation

Suggested items: Orbital shaker or magnetic stir plate

What's it for? Constant agitation of microbial cultures promotes better growth by providing aeration and preventing settling.

Notes: A magnetic stir plate and stir bar are a simple way to agitate a growing culture. Benchtop orbital shakers allow the user to grow several cultures at once either at ambient temperature or at a controlled temperature. Typically, if you will be growing more than 3 cultures at a time it is cost and space efficient to use a bench top orbital shaker rather than a multi position stir plate. If you will be culturing in an environment without controlled temperature you may want to consider a temperature controlled shaking incubator (much more expensive and typically with a much bigger footprint.)

Other Supplies

Powder free exam gloves (for use when handling sanitary samples)
500ml Plastic spray bottles (for 70% alcohol and other liquid sanitizer)
Pre-sterilized 15ml and 50ml sterile centrifuge tubes (extremely useful for sampling and storing samples etc.)

Sterilizer

Suggested items: Autoclave or Electric Pressure Cooker (6 Liters or larger. The larger the better)

What's it for? A steam sterilizer is necessary for lab programs that desire to make their own microbiological media and/or sterilizing glassware for sampling, culturing, performing forced wort and forced fermentations etc.



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Notes: Most breweries can make do without a sterilizer by purchasing sterile single use tubes for sampling and pre-made agar media. Autoclaves are expensive, energy intensive pieces of equipment that sterilize using steam at a high pressure. We recommend you consider your needs carefully before purchasing one. Pressure cookers when used properly work well for sterilizing small volumes of media or glassware. In a pinch, dry heat sterilizing in your home oven can be used for glassware (360F for 2 hours).

Incubators

Suggested items: Temperature controlled incubator. A bench top model is sufficient. A two-way incubator that heats and cools will allow you to select temps cooler than your ambient. “Heat only” incubators can only create warmer than ambient temperatures.

What's it for? Controlling the temperature during agar plate growth.

Notes: Most breweries do not need an incubator. Even if you incubate a lot of agar plates if your environment stays between 70F and 80F it is usually unnecessary for most applications. If your environment is too cold (i.e. less than 70) a heat only incubator is more cost effective. If your environment is too warm (>80F) you will require a refrigerated incubator capable of heating and cooling. When purchasing search for microbiological incubators or general-purpose laboratory incubators.

Laminar flow hood

Suggested items: Horizontal or vertical laminar flow hood.

What's it for? Laminar flow hoods push HEPA filtered air across the hood toward the user providing a sanitary work environment by excluding airborne particles (not to be confused with fume hoods which are essentially the opposite-- they draw air in to protect the user from toxic fumes). Laminar flow hoods are used for sampling, passaging cultures and other tasks that require a sanitary environment.

Notes: Most breweries can get by without a laminar flow hood by relying on a flame to create a sanitary work environment. If your microbial QC and yeast management program grows large enough you should consider a laminar flow hood. For most purposes a bench top laminar flow hood that you place on a stainless table is a more affordable option than purchasing a completely contained cabinet unit. Vertical flow hoods filter air in the top of the unit and blow down towards the surface. Horizontal flow hoods filter air in the back of the hood and blow it directly at the user. If you are working with large volumes of liquid that may spill and damage your filter or have space constraints, consider a vertical laminar flow hood.



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