



FORMULATING 101  
EQUIPMENT FOR YOUR

*Home Lab*



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## EQUIPMENT FOR YOUR HOME LAB

**In this class, we will cover:**

1. Where to buy your equipment.
2. The importance of a clean, well-organized workspace.
3. The equipment to consider for your home lab or for small-scale production.



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## WHERE TO BUY YOUR EQUIPMENT

There are several places that you will be able to find the equipment you need. For the essentials for making small batches, the following places are useful:

- Online stores selling science lab equipment such as [BetterEquipped.co.uk](http://BetterEquipped.co.uk) (UK) or [www.carolina.com](http://www.carolina.com) (USA).
- Kitchen supply stores.
- Cosmetic ingredient suppliers often also sell equipment.
- Amazon or eBay. While we do not recommend buying ingredients on eBay or Amazon, they are useful for finding equipment.
- Specialist stores, for example, for weighing scales or mixers.

## THE IMPORTANCE OF A CLEAN, WELL-ORGANIZED WORKSPACE

Having a clean workspace will reduce the number of errors that could occur. For example, if you have lots of raw materials placed everywhere over your workspace, you could easily use the wrong ingredient in your formula. You also reduce the possibility of contamination occurring by ensuring your workspace is clean.



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## THE EQUIPMENT TO CONSIDER FOR YOUR HOME LAB OR FOR SMALL-SCALE PRODUCTION

Here is a list of the equipment that you should consider using in your home lab:

- Protective clothing.
- A bain-marie or water bath for a source of heat.
- Two glass Pyrex bowls or glass beakers.
- Two thermometers.
- A stick blender (hand-held immersion blender).
- Electric whisk.
- Digital scales.
- Heat-proof glass beakers.
- Small beakers/ weighing boats/watch glasses/pipettes.
- Spoons/spatulas for weighing out ingredients/mixing.
- pH strips or a pH meter.
- A large saucepan.
- Sufficient packaging.

We will now take a look at this list in more detail.





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## PROTECTIVE CLOTHING

The first thing you will need is a protective overall or a white lab coat. This will help protect your clothes from any damage from the raw materials or even from your finished formula. Goggles are really important. Goggles will prevent particles (from raw ingredients) from getting into the eyes, and also prevent any products getting into eyes. For example, when you are combining an oil and water base.

We also recommend you wear disposable gloves. This is to prevent contamination when handling different raw materials and also to protect the skin from coming in contact with these raw materials, which can cause irritation.

When working with powdered ingredients, wearing a mask over your mouth and nose is also recommended to prevent you from inhaling the particles.





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## A BAIN-MARIE OR WATER BATH FOR A SOURCE OF HEAT

You will need a water bath or a bain-marie (double boiler) and a source of heat. This is for heating the oil and water phases of an emulsion and also for melting ingredients like waxes and butters.

A professional lab setting would use a water bath, but these can be quite expensive. A bain-marie would give you exactly the same effect and would be much cheaper to create.

To create a bain-marie you place a glass beaker containing the ingredients to be heated inside a saucepan containing water. Usually the beaker is placed on a trivet. Then the saucepan is placed on a heat source. You could also place one saucepan inside another; or use a double boiler insert. Depending on which method you choose, the following may be useful:





***An alternative to  
a double-boiler  
is a hotplate.***

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**Two saucepans** to fill with water and provide the 'bath'/heat source. When making emulsions you will require two bains-marie (one for your water phase and one for your oil phase).

**At least two Pyrex jugs, heat-proof glass lab beakers or autoclavable polypropylene chemical-resistant beakers.** The reason for using glass is that, because glass is inert, it will not react with any raw materials. If you choose to use beakers then you will need to think about how you will handle these when they are hot. You can use special tongs or heat-proof gloves.

The size of the beakers or bowls would be dependent on the batch size you are making, so please take that into account when selecting the sizes. When creating a bain-marie, the saucepan will need to be filled with sufficient water to heat the ingredients, but it is important that it does not overflow when containers are placed into them, so you may want to do a test first.

It is also important that the beaker and the contents are heavy enough to sit in your saucepan because if it is not, the beaker will tilt and there is a possibility that your ingredients will spill out into the water in the pan.

**Double boiler maker or metal trivets/rings** (even a cookie cutter would work). You place the beakers on top of these items, so the beakers do not touch the bottom of the saucepan.

**Double boiler insert.** These are often sold as melting pots for chocolate making and sit inside a saucepan of water.

An alternative to a double-boiler is a hotplate.



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## A THERMOMETER

You will also require a thermometer to measure the temperature of the contents of the containers whilst they are being heated in the water bath. If you are making an emulsion, it is really important that both the oil base and the water base are at the same temperature before you combine them. For this you may require two thermometers.

Inexpensive glass lab thermometers are sufficient, or you may like to invest in an infrared thermometer.



## STICK BLENDER/IMMERSION BLENDER

Stick blenders are very usual for homogenizing emulsions and for mixing other ingredients. You will require a stick blender that is long enough to reach the bottom of the bowls or the beakers. You will use this to create your emulsions. One with a stainless steel blender is easier to clean. The blender will need to be good quality. Metal ones have the advantage that they are resistant to high temperatures, but if they are not good quality, they may release ions into the product during emulsification. Plastic hand blenders are more sensitive to high temperatures, so if you do use a plastic one it is important that it is of good quality.

In a professional lab a homogenizer would be used, but as these are really large and expensive pieces of equipment, at home you can use a stick blender instead.



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Professional chef hand blenders are a good option.  
Here are two examples:

#### **bamix® Classic**

- Very powerful
- 10,000-15,000rpm

[https://www.bamix.com/shop/eu\\_en/](https://www.bamix.com/shop/eu_en/)

#### **Dynamic Dynamix Stick Blender MX050**

- Up to 13,000rpm
- Good for bigger batches (up to 4 liters)

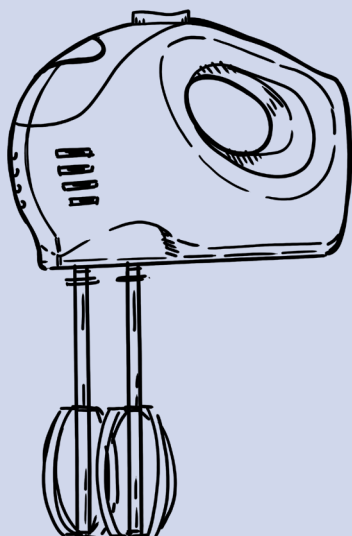
[www.nisbets.co.uk/dynamic-dynamix-stick-blender/cf001](http://www.nisbets.co.uk/dynamic-dynamix-stick-blender/cf001)

[www.dynamicmixers.com/en/our-products/hand-mixers-and-whisks/dynamixr-dmx-160.html](http://www.dynamicmixers.com/en/our-products/hand-mixers-and-whisks/dynamixr-dmx-160.html)



Our tutors also recommend the following blenders, though others are also suitable:

- Vremi hand blender.
- Bosch 600 watts hand blender (CleverMixx Dip & Dressing 600 W White MSM2623GGB), which has two detachable heads: one for larger batches and one for small test batches. The Bosch CleverMixx Baby also comes with a smaller head for smaller batches. (You may require an adapter for the Bosch mixers depending on where you are located.)



## ELECTRIC WHISK

An electric whisk is useful for creating whipped body butters. It can also be used for certain cold-process emulsifiers such as Sucragel.

## DIGITAL SCALES

Generally, the more you spend on your scales the more accurate they will be.

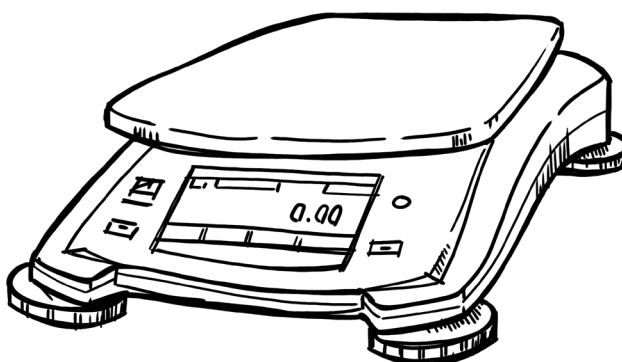
Consider the maximum capacity of the scales and the resolution or readability (degree to which it measures, eg 0.1g or 0.01g). You need to make sure they are accurate down to 0.1g, or less, if you require it. You also have to make sure that the scales go up to the batch size you wish to make. If you want to make a kilo, make sure your scales can actually read to a kilo.

For example, a scale that measures up to 1,200g or 2,000g with a 0.01g resolution would be very useful.

Some reliable brands of scales are:

- Vibra
- Ohaus
- Mettler
- Sartorius
- Kern

Our cosmetic scientist recommends Ohaus scales, for example Ohaus SKX2202 2200g x 0.01g.







If you need a budget option for home formulating then kitchen scales and/or jewellery scales are an option, although the accuracy varies greatly. You may like to buy calibration weights to check the accuracy of your scales before using them. You may even require two sets of scales, one for small measurements (eg between 0.01g and 250g or 500g) and one for larger measurements (up to the batch size you wish to make).

Our students and tutors recommend the following budget option scales:

Pocket jewellery scales:

- Smart Weigh SWS100 Elite Digital Pocket Scale 100 (available on Amazon)
- GDEALER Digital Pocket Kitchen Scale 0.001oz/0.01g 500g (available on Amazon)

Kitchen scales:

- Jennings CJ4000 or Jennings CJ600
- American Weigh Scales AMW-SC-2KG Digital Pocket Scale



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## TRADE-APPROVED SCALES

If you are going to be selling products you may need scales that have been approved for trade use for weighing the finished products before labeling and selling them. For example, in the UK you will need to comply with the Weights and Measures Act and will need trade-approved scales approved by Trading Standards.

The most accurate scales will be available from specialist weighing scale suppliers who will provide calibration certificates and instructions.

Some examples are:

[www.inscale-scales.co.uk](http://www.inscale-scales.co.uk) (UK)

[www.csgonline.co.uk](http://www.csgonline.co.uk) (UK)

[www.oakleyweigh.co.uk](http://www.oakleyweigh.co.uk) (UK)

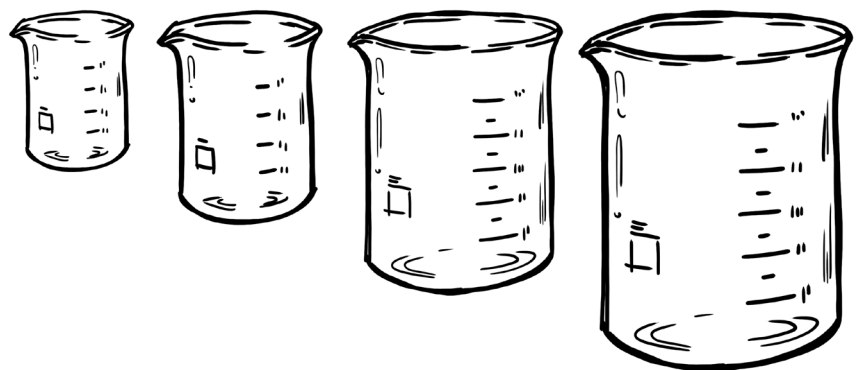
[www.andweighing.com.au](http://www.andweighing.com.au) (AUS)

[www.weighingscales.com](http://www.weighingscales.com) (UK)

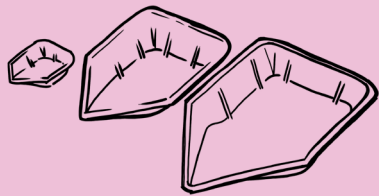
[www.balances.com](http://www.balances.com) (USA)

## HEAT-PROOF GLASS BEAKERS

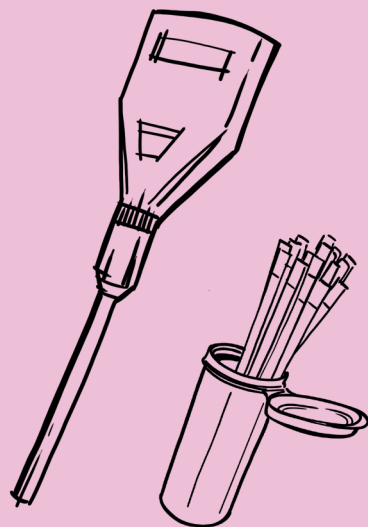
Heat-proof glass (borosilicate) beakers in a variety of sizes are very useful. For example, 50ml, 100ml, 150ml, 250ml, 400ml, 600ml and 1,000ml. They can be used for measuring, mixing and heating ingredients. 50ml-250ml are useful for small scale production. 400ml-1,000ml are useful when you are ready to scale up and make bigger batches.







Above: This shows a watch glass in use



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## WEIGHING BOATS/WATCH GLASSES/PIPETTES

For weighing small quantities of solids or powders, you could use weighing boats. Plastic weighing boats are disposable, so for each different powder you should use a different weighing boat to prevent contamination.

Watch glasses are very useful for weighing small quantities of powdered or solid ingredients and have the benefit of being reusable.

Pipettes are used for measuring/weighing small quantities of oils and liquid extracts. Disposable pipettes are useful from a hygiene/contamination perspective, as pipettes are extremely difficult to wash, sanitize and reuse. Every time you weigh a different liquid, you should use a different pipette to prevent contamination.

## SPOONS/SPATULAS

You will also require spoons and spatulas for weighing out ingredients and mixing. Stainless steel spatulas are very useful.

## pH STRIPS OR pH METER

For more information about using a pH meter and how to test and adjust the pH of your cosmetics, please refer to the pH Masterclass within the Formulation Lab section of the Natural Cosmetic Formulation Club.

## A LARGE SAUCEPAN

A large saucepan can be used as a cooling bath, into which cold water can be added from a tap or container. This can be useful for cooling emulsions, for example.

## PACKAGING

You need to ensure you have sufficient packaging (eg jars and bottles) to fill the finished batch in. You will also need a space where they can be easily and efficiently filled.

## SUMMARY

In this class we looked at the equipment that you will need in order to manufacture products on a small scale at home. Most of this equipment can be purchased fairly inexpensively from lab supply or kitchen supply shops, or through online retailers such as eBay and Amazon. It is advisable to invest in good quality weighing scales and a good quality stick blender from specialist manufacturers.







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