Sustainable Water Use

Author	Role	Version	Issue date
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1. Purpose

This document provides information on water used by equipment in the laboratory and also guidance on the different types of water available and why it is important to select the correct water type for your application. This document also supports the University to achieve objectives set out in the Environmental Policy and maintain compliance with the ISO 14001:2015 environmental management system.

2. Scope

This document is relevant to all laboratory users.

3. Procedure

Water is essential to all life on earth and therefore must not be wasted. Human activities are pushing the loss of freshwater to an unsustainable level.

Some of the items of equipment we use in the laboratories are extremely water intensive and we need to look at ways we can reduce this water consumption. As well as equipment we also need to think about the amount and type of water we use in the laboratory.

3.1. Autoclaves

As well as being extremely energy intensive autoclaves also use a huge amount of water. Depending on the size of the autoclave they can use up to 60 gallons of water per cycle. We can reduce the use of autoclaves by:

- Consolidating items – only run the autoclaves when they are full, set times for clean runs to allow items to build up.
- Think about what you are autoclaving, does it really need to be sterile?

- When purchasing a new autoclave there are a few things to consider – look at the energy efficiency and water consumption and choose the most efficient. Consider what size you need, if you can purchase a smaller autoclave then this would be more efficient than a larger autoclave.

3.2. Glasswashers

Glasswashers and dishwashers in the laboratories can also use a lot of water, make sure that these are only run when there is a full load. Be mindful of how much water you are using when rinsing out glassware and what purity you are using to rinse (see section 3.6 – water purity).

3.3. Condensers

Water condensers can consume 2 litres of water per minute with reactions running from several hours to overnight. As well as sending huge amounts of water down the drain there is also a risk of flooding the laboratory.

One way to avoid both these issues is to replace water condensers with waterless air condensers, these use a unique glass forming technique to promote condensation of vapours and gasses by the surrounding air.

3.4. Aspirators

Water aspirators are connected to the faucet and require 4 litres of water per minute to create a vacuum.

Water aspirators should be replaced with vacuum pumps where possible.

3.5. Water baths

Although water baths don't use excessive amounts of water we still need to be mindful when using them. Water baths are prone to contamination and because of this have to have regular water changes and have chemicals added.

One way to prevent contamination and excess water use is to replace the water with amour beads. These are dry metal beads designed to replace water in non-circulating and non-shaking water baths. They are more resistant to bacterial growth and promotes a sterile work area. This fact sheet contains more information on amour beads.

It should be noted that amour beads are not compatible with all water baths, this guide provides information about their use and compatibility.

3.6. Water purity

There are a number of different types of water that are used in the laboratory, each of which has varying levels of purity.

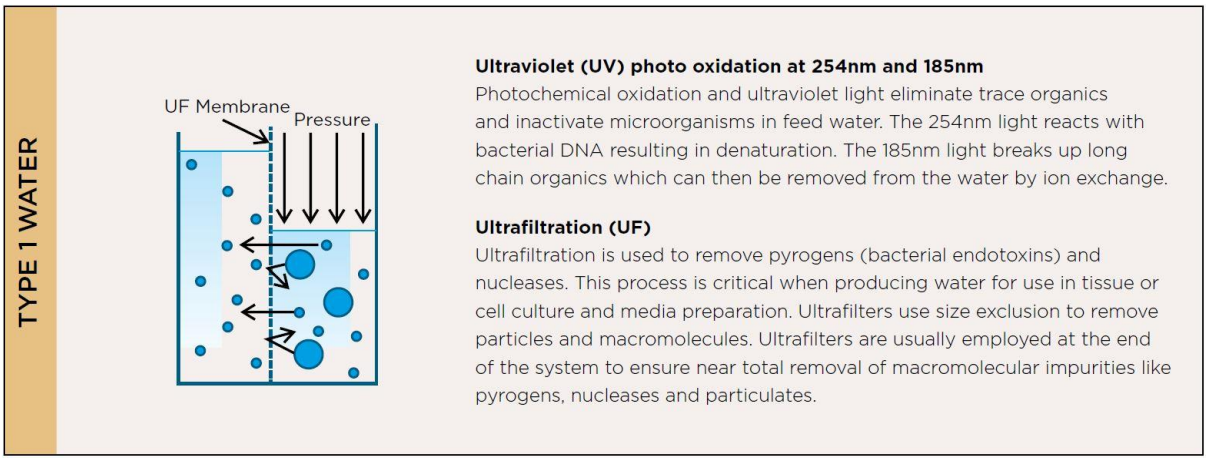
Tap water

Fine for washing hands but this contains dissolved ions and salts and is therefore not ideal for making reagents that can be affected by these materials.

Type 1 Water (Ultrapure Water)

Type 1 or ultrapure water is the purest form of water, it has extremely low levels of ions, organics and biological contaminants. Type 1 water is used for the most critical applications including:

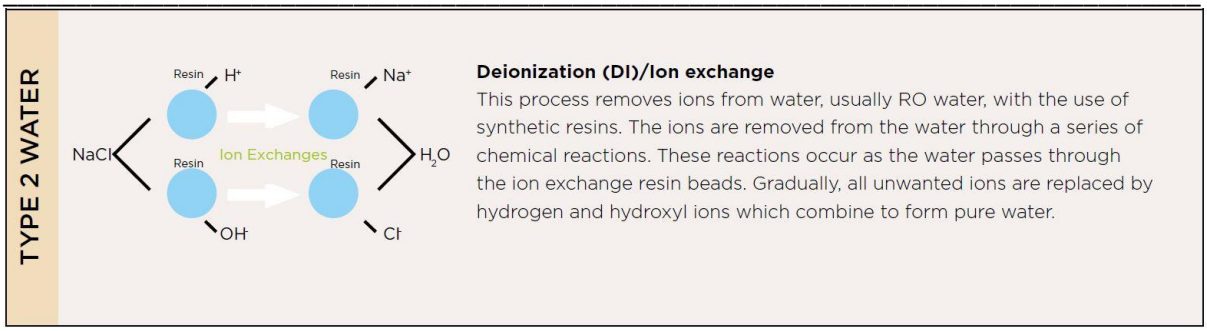
- Cell and Tissue Culture
- Liquid Chromatography, including High Performance Liquid Chromatography (HPLC)
- Gas Chromatography
- Inductively Coupled Plasma Mass Spectrometry (ICP-MS)
- Molecular Biology
- Polymerase Chain Reaction (PCR)



Type 2 Water (Deionised)

Type 2 or deionised water is more economical and uses a different grade of ion-exchange resin. While it still maintains a high purity level it is used for applications that don't require the highest level of purity. Type 2 water can be used in the following applications:

- General Lab Practices
    - Buffer preparation
    - Media preparation
    - Sample dilution
    - General chemistry
- Feed water for clinical analyzers
- Microbiological Analysis and preparation
- Electrochemistry
- FAAS
- General Spectrophotometry



Type 3 Water (RO Water)

Type 3 or RO water is produced through the purification technology reverse osmosis, it is the most economical method of removing up to 99% of contaminants in potable water. Type 3 has the lowest purity level and can be used for the following applications:

- Cleaning glassware
- Water baths
- Autoclave feed

When carrying out experiments you need to make sure the correct level of purity is used to prevent contamination and the need to run repeats but it is essential that you do not use a level of water purity that is over pure for your requirements.

It can take up to 5L of tap water to make 1L of ultra-pure water, wasting 4L of water down the drain.

Source – Avidity Science [Lab Water Purification Systems | Lab Water Systems | Avidity Science]

3.7. Maintenance

Check taps for leaks and report any issues immediately. Dripping taps can waste up to 1460 litres of water per year.

4. Changes to the procedure

Version	Reason for change	Date
1.0		January 2024
2.0	Change to section 3.6	November 2024