

# Prepare it once, use it many times: the levelling tube

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## Abstract

A set of prepared levelling tubes appears to be very useful for the instructor, enabling her or him not to worry at all when the levels of the end parts (tubes) of the equipment differ, and to keep a high degree of aesthetical appreciation of the experimental setup.

## Introduction

The relations between chemistry and aesthetics have been pointed to in the literature<sup>1,2</sup> and the references therein. It is less known, perhaps, that there exist certain aesthetical criteria about the experimental setups for demonstrations in chemistry education.<sup>3</sup> One of the general rules when assembling a setup for a demonstration is that it should be as symmetrical as possible. Further, the glass tubes should go only horizontally and vertically (i.e., at right angles to each other), using as-short-as-possible rubber or plastic tubings for joining the parts.

Keeping the latter in mind, for many years we used what we called “a levelling tube” or “an S-tube”.<sup>4</sup> The tube enabled us to stick to the above aesthetical principle, without having to raise the level of some of the items (using a stand and a clamp, for instance).

We now propose that the experimenter prepares in advance a series of doubly bent “S-tube”. Once prepared, the collection could be used almost indefinitely. This collection enables the experimenter to pick the desired tube with an optimum ‘step’ (Fig. 1), during assembling the experimental setup.

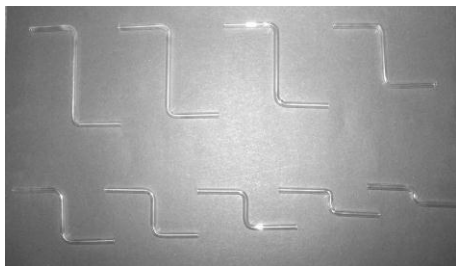


Fig. 1: A collection of levelling tubes

## An example

Say, one has to connect the outlet tube of a Kipp with a wash-bottle. Unless it happens accidentally, the tubes to be joined will be at different levels. Now, one solution to the problem is to use a rubber tube (Fig. 2). However, even without any knowledge of the above-mentioned aesthetic criteria,<sup>3</sup> one could immediately say that the setup is, at the very least, “highly unattractive”.



Fig. 2: A Kipp apparatus joined to a wash-bottle via rubber tubing — an example of aesthetic disaster

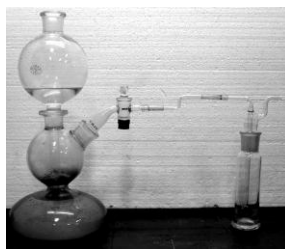


Fig. 3: A Kipp apparatus joined to a wash-bottle using a levelling tube — an example of aesthetically appealing setup

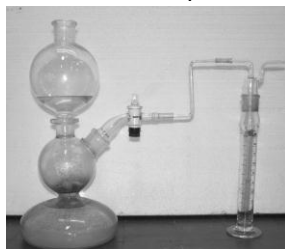


Fig. 4: A Kipp apparatus joined to a wash-bottle of different size or type

The recommended alternative would be to use the appropriate levelling tube (S-tube) from our collection (Fig. 1), that would result with a setup given in Fig. 3.

Indeed, with a wash-bottle of another type or size, the only difference will be the usage of another suitable levelling tube (Fig. 4).

The careful and cautious reader may notice that, in fact, one can always use a single S-tube which is then to be rotated at one of the ends, until its level perfectly matches the level on the other side. While this is indeed true, it must be said that rotating the S-tube destroys the symmetry of the setup (due to loss of a plane of symmetry), and the descent of symmetry makes it aesthetically less appealing.

The recommendation<sup>3</sup> that tubes should go only horizontally and vertically (i.e., at right angles to each other), has not been justified. However, this requirement might be understood in the light of the hidden symmetry of the right angle. Actually, it is the only angle that is equal to its supplement angle!

The present contribution may also be considered as a continuation of our series of papers “prepare it once, use it many times”.<sup>5-7</sup>

## References

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