

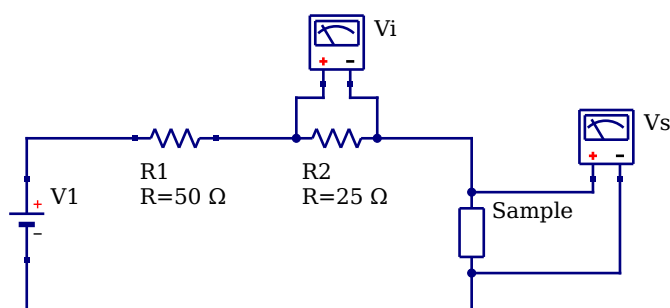
Copper at Low Temperatures Virtual Experiment

1 Introduction to the virtual experiment

This virtual experiment is strongly based on a practical experiment that has been done in the Yr 3 Condensed Matter lab. Both this virtual experiment and the practical experiment are controlled through a software control panel. The difference is that the controls of the practical experiment are connected to a sample of copper wire in a liquid helium cooled cryostat, whereas the controls of the virtual experiment connect to a model based on the details of the practical apparatus.

From the point of view of a person using the controls, it should be hard to tell the difference between the virtual and practical experiments. Therefore, you should follow the manual for the practical experiment while doing the virtual one. The parts of the manual relating to details of the apparatus have been shaded grey, to indicate you do not need to pay attention to these in the virtual experiment.

The electrical circuit that heats the sample is shown here. V_1 is the heating voltage; V_i and V_s are voltmeters.



2 Initial Investigations

These differ from the practical experiment.

Access the virtual control panel at <https://cm1ab.humb.uk/virtex/cult>

- The sample will be sitting at a high temperature and cooling slowly when the experiment starts. Use the sorb to cool it down. Investigate the effect of the sorb after the sample has cooled.
- You will only get a resistance reading with the sample heating voltage turned on (why?). Warm the sample and observe the rate of rise of temperature and resistance.
- Download the data and check how it corresponds to the data visible on the control panel.

3 Possible investigations

These remain the same as in the practical manual. Note that the cheats on the control panel allow you to do things that the real apparatus cannot do, and may yield unreasonable results. Speeding things up by a modest factor is safe.