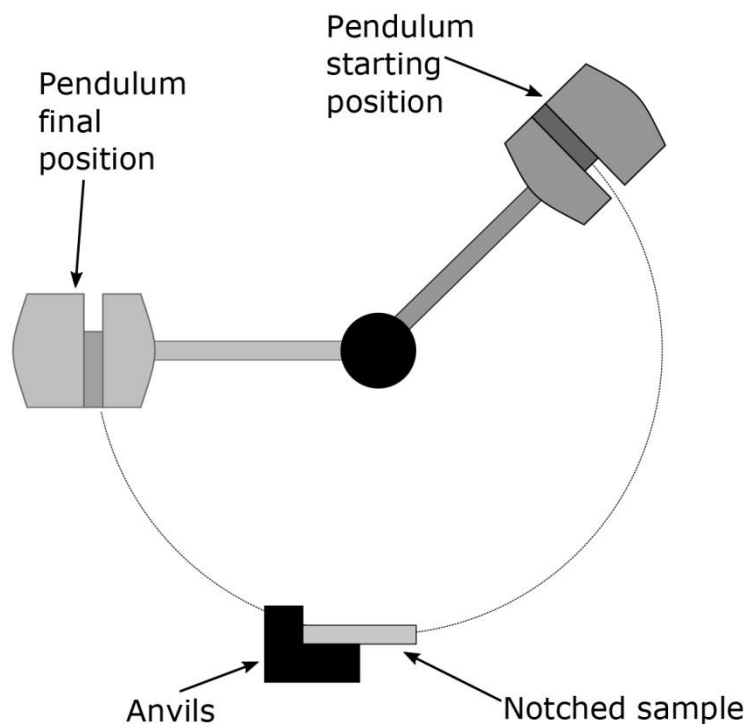


# TECHNICAL REPORT WRITING FOR ENGINEERS

## EXAMPLE PROCEDURE SECTION

### 3 Procedure

This experiment involves breaking six samples at varying temperatures using a Charpy machine, as shown in figure 3.1, and measuring the energy absorbed by the sample during impact.



**Figure 3.1:** A schematic of a Charpy impact tester

The experiments were conducted at varying temperatures sample temperatures, shown in table 1.

**Table 1:** Thermal conditions for the samples used in the Charpy machine

Test number	Sample Temperature	Environment used
1	-196 °C	Liquid Nitrogen
2	-80 °C	Dry ice
3	0 °C	Iced water
4	20 °C (approx.)	Room temperature
5	100 °C	Oven
6	200 °C	Oven



The availability of equipment and materials capable of maintaining these temperatures and into which the sample can be immersed was their reason for selection.

To fabricate the six samples required for testing in the Charpy machine, 3 mm steel was cut in a vertically milling machine to a rectangular section of 25 mm by 10 mm. A V-shaped notch, measuring 2 mm by 1 mm, is ground into the 25 mm length of the specimen. To allow later identification, each sample was labelled.

Two thermostatically controlled ovens were preheated to 100°C and 200°C. Using heat resistant gloves and tongs, one sample was placed in each oven and left for sufficient time to reach equilibrium temperature. A further two samples were immersed into iced water (0 °C) and dry ice (-80 °C) using the tongs. Room temperature was determined using an alcohol thermometer located in the laboratory.

Before conducting the first experiment, the operation of the Charpy machine and interlockers on the protective doors were checked.

A sample at room temperature was loaded between the anvils of the Charpy machine, with the notch facing away from the hammer. The precise location of the sample was adjusted using the locating prong and the protective doors were closed.

Instrumentation built into the Charpy machine was zeroed and the hammer released, breaking the sample. The impact energy was recorded from the digital display. In order to later examine the fracture surface, the broken sample was allowed to return to room temperature, to avoid the risk of burning, carefully removed from the machine and stored.

For safety reasons, heat resistant gloves and tongs were used to remove the sample from the oven at 200 °C, and it was placed into the Charpy machine. The time taken to move the sample from the hot and cold environments was minimized to reduce the heat loss from the sample during transit, which would reduce the temperature of the sample from its known value. The impact test on the Charpy machine was conducted following the same procedure adopted for the room temperature sample. This was then repeated for the sample from the 100 °C oven, the sample immersed in the iced water and the sample immersed in the dry ice.

To perform the final test, heat resistant gloves and a face mask were used to ensure protection from the risk of burns. The remaining sample was lowered, using tongs, into a dewar of liquid nitrogen until the production of white vapour ceased. This indicated the sample had reached a temperature of -196 °C. The sample was then placed into the Charpy and tested using the same method as the other samples.

The fracture surface of all six samples were examined and recorded.