

Heat Experiments – Practical Notes

- Most of the errors in these experiments arise from inaccurate temperature readings, so it is advisable to use a 0.1 °C thermometer. Avoid small temperature changes in the experiments as these can result in large possible percentage errors.
- Also, avoid having too large temperature differences between the calorimeter and its surroundings. Remember that the rate with which heat flows from one place to another (e.g. calorimeter and surroundings) is dependent on the temperature difference between the two places.
- Take temperature readings at eye level so as to avoid the error of parallax. A small magnifying glass can help in accurately determining the correct thermometer reading.
- Use of a highly polished calorimeter reduces heat loss by radiation.
- Use of a lid on the calorimeter reduces heat losses by convection and evaporation.
- A stirrer, if used, should be of the same material as the calorimeter. The mass of the stirrer should be included in the mass of the calorimeter. Thermometers are widely used in practice as stirrers but mercury-in-glass ones often break, releasing the mercury, which is toxic.
- Always stir the liquid in a calorimeter before taking a reading, and take the highest or lowest (whichever it may be) *steady* temperature.
- In electrical methods, where a constant current is required, always include a rheostat.
- When a heating coil is used it must always be completely covered with liquid to prevent it 'burning out'.
- A polystyrene cup is a useful object in heat experiments as it has a negligible mass and heat capacity and almost all the heat energy goes into the liquid contained in the cup. This reduces the final calculations.
- Substances added to water in a calorimeter (e.g. ice) should be transferred quickly, but without splashing.
- When time allows, experiments should always be repeated, and an average value of the quantity to be measured taken.
- Insulation or lagging (draught proofing) is all important in experimental work on heat, as quite a lot of thermal energy can be lost (or gained) to (from) the surroundings. Any good insulating material like polystyrene, cotton wool, felt or straw may be used. A piece of 'aero board' placed underneath the calorimeter as a stand will also help.
- To minimize heat losses/gains to/from the surroundings, start with the calorimeter a few degrees below room temperature and finish with it an equal amount above room temperature (or vice versa if the experiment involves cooling).