

# Chemical Magic at Home

## How to Use the Meccano Kemex Outfits

EVERYTHING in the world around us is built of chemical elements and their compounds. These compounds undergo ceaseless changes, and the study of these changes forms the basis of the wonderful science of chemistry. The Kemex Outfits have been introduced to provide apparatus, materials and instructions for carrying out a series of fascinating experiments, in which the secrets of chemical science are revealed.

The amount of fun that can be obtained from a Kemex Outfit is practically unlimited, but to get the best from an Outfit it is necessary to go about things in



Fig. 1. A well-arranged experiment. The Test Tube in which a solution is being prepared is held in the correct position, with its mouth pointing away from the face, and the rest of the apparatus is within easy reach, but is not in danger of being accidentally knocked over.

the proper way. A miniature railway set that is simply spread out on the floor anyhow, with trains running about without any method, is interesting for a little while, but soon it becomes wearisome and monotonous because it is not based on any kind of system. It is just the same with a Kemex Outfit. If the contents are simply tumbled out on a table and a few disconnected experiments are made, the real interest of the Outfit is missed, and its owner soon becomes tired of it. If, on the other hand, an Outfit is used with even a small amount of method, the original interest does not fade away, but increases with every experiment that is made.

The containers in which the chemicals are packed are designed to keep their contents out of contact with moist air, an important precaution with many chemicals. For this reason the containers should be opened only when part of their contents is actually required for use. As soon as the required amount of the chemical has been measured out, the cap or cover should be replaced and the container returned to its correct position in the box. The aluminium caps of the glass containers should be screwed down as far as they will go, in order that the tubes may be sealed properly by means of the small cork pad in the top of the cap. If open containers are left on the table they are almost certain to be knocked over and their contents spilled.

For most of the experiments described in the Kemex Manuals there is no advantage in using large quantities of chemicals, for small quantities give equally good results. The Scoop (Part No. K36) provides a measure of suitable size, and the instructions given for its use should be followed. In making experiments that are not dealt with in the Manuals, trials should always be made first with very small quantities of chemicals, otherwise a good deal of material is likely to be wasted. Those who have not had any previous experience in experimenting with chemicals will be surprised to find how small an amount of the various substances is sufficient to produce the required result.

The next important point is cleanliness. All glass apparatus should be rinsed out immediately after use, unless of course it is desired to keep the contents for a subsequent experiment. A stiff Test Tube Brush for cleaning the inner surfaces of glass vessels is included in each Outfit. In using this Brush a little discretion is necessary.

Test Tubes, for instance, are fragile things, and if the Brush is slammed violently to the bottom of one it is more than likely to go straight through! The proper way to clean a Test Tube is to half fill it with water and then push the Brush slowly to the bottom with a screwing motion. If Test Tubes are not cleaned immediately after use it will be found much more difficult to make them chemically clean later. It should be remembered that the whole effect of many of the most interesting experiments is completely lost if the Test Tubes in which they are carried out contain traces of chemicals from previous experiments. Washing operations cannot be carried out very satisfactorily on the work bench or table, and by far the best place for the purpose is a sink.

Glass apparatus should never be put away wet, but should be allowed to drain after washing, and then be carefully wiped dry, both inside and outside. The Flask included in the Kemex Outfits has a wide neck, so that a clean cloth can be rubbed over its inner surface without much difficulty.

In order to dry a Test Tube, twist a corner of the cloth to a sufficiently small size and screw it gently into the test tube to the bottom.

A glass vessel that is dried with a cloth in this manner is not chemically dry, however, for no matter how much care is devoted to the wiping process, the surface of the glass still retains a thin layer of moisture. This of course is of no importance in experiments with solutions, and in such experiments a test tube that has been well rinsed out should be used without being wiped with a cloth. For certain experiments described in the Manuals a chemically dry Flask or Test Tube is required, and if the vessel has just been

washed and wiped it should be carefully warmed to remove the last traces of moisture. A glass vessel that is to be heated should never be placed over the flame of the Spirit Lamp while its outside is wet.

If possible a special table, the older the better, should be set apart for experimental work. There is a great satisfaction when one is carrying out chemical experiments in knowing that it does not matter if anything is spilled. If a special table is not available and an ordinary room table must be used, precautions must be taken to prevent any liquid that may be spilled from reaching the table top. Perhaps the most effective cover for the table consists of an old and dilapidated tablecloth covered with several sheets of paper. In any case it is a good plan to have a cloth at hand to mop up any spilled liquid before it has time to soak through. With ordinary care accidents should be very few, but even if every precaution is taken one is almost sure to happen occasionally.

A little attention should be given to the layout of the apparatus in use, in order to avoid confusion. A good idea of a suitable general scheme may be gained from Fig. 1, in which the experimenter is preparing a solution by warming a chemical with water in a Test Tube. The Test Tube Stand is being correctly employed to hold the Test Tubes not in use, including one that contains liquid for an experiment connected with the one actually in

Fig. 2. A Delivery Tube being worked through a Cork by a slow screwing motion.

