

## Vacuum Student Kit 1003494

### Instruction Sheet

04/18 ALF



- 1 Hose with T-piece and valve
- 2 Hose with valve
- 3 Recipient (Experiment plate and bell jar)
- 4 Hand pump in case
- 5 Beaker
- 6 Mini bellows
- 7 Balloon

#### 1. Description

Set of equipment for introducing the fundamentals of vacuum physics by means of student experiments. Subjects that may be studied experimentally may include, for example:

- Determining mass of evacuated air and density of air
- Effect of air pressure on a slightly inflated hot-air balloon and on a suction cap
- Lowering of the boiling point of liquids at decreased air pressure

A complete set of equipment consisting of an experiment plate incorporating a rubber ring and a bell jar that can be joined together with a recipient to enclose a coarse vacuum. The bell jar is equipped with a hose connection for attaching a plastic hose with a built-in valve. Evacuation is achieved using a simple hand pump. Beakers, bellows and balloons are provided for the experiments.

All components are made of transparent plastic.

#### 2. Scope of delivery

- 1 Experiment plate with washer
- 1 Vacuum bell jar
- 1 Hose with check valve
- 1 Hose with T-connector and check valve
- 1 Simple hand pump in storage container
- 1 Suction cap
- 1 Beaker
- 2 Balloons

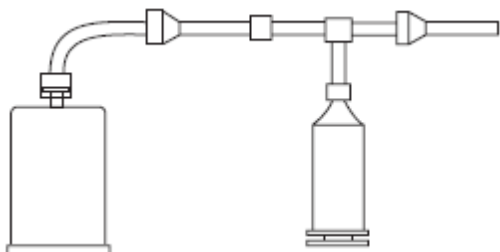
#### 3. Technical data

- Experiment plate: 70 mm Ø approx.
- Bell jar: 90 mm high approx.

#### 4. Set-up of experimental apparatus

- When attaching hoses do not use excessive force. Do not exert more than the pressure of your fingertips on the hose connectors when joining them together.

- Connect the hand pump to the bell jar via a hose as shown in the illustration. Slip the hose connectors inside one another and secure by turning with slight pressure from the fingertips.



## 5. Sample experiments

### 5.1 Lowering of the boiling point of liquids

- Set up the apparatus as in the illustration.
- Fill the beaker with warm water and measure its temperature.
- Put the beaker on the experiment plate and place the bell jar over the top of them.
- Press the jar onto the plate and operate the pump until the liquid visibly starts to boil.
- Loosen the hose connection to the jar to let in air.
- Measure the temperature of the liquid once again.
- Compare the two temperatures and discuss.

### 5.2 Effect of reduced air pressure on a balloon

- Set up the apparatus as in the illustration.
- Put a partially inflated balloon on the experiment plate and place the bell jar over the top of them.
- Press the jar onto the plate and operate the hand pump 10-15 times.
- The balloon inflates.
- Alternative experiments can be performed using a mini bellows or a small quantity of shaving foam in a beaker.

### 5.3 Determining the mass and density of air

Also required:

- 1 set of scales measuring to the nearest 0.01 g
- 1 measuring beaker

- Press the bell jar and experiment plate together. Attach hose (2) and determine the total weight.
- Connect the hand pump and evacuate the recipient.
- Loosen the connection between hoses (1) and (2) and measure the total weight of evacuated jar and hose connection.
- The difference in weight indicates the mass of air pumped out.
- Let air into the bell jar.
- Re-attach hose (2) to determine the volume.
- Fill the recipient and hose (2) with water adding a bung or holding your finger over the end of the hose.
- Pour the water into a measuring beaker and read off the volume.
- Determine the density of air by dividing the mass by the volume.

## 6. Cleaning

- To clean, use only warm water with a small amount of washing-up liquid. Never use solvents.