Respirometer

65998.00

Operating Instructions

Fig. 1

Fig. 2

1 PURPOSE AND DESCRIPTION

With a respirometer metabolic processes under which a gas is formed or consumed can be volumetrically examined and measured. In contrast to manometry where pressure changes are measured at constant volume (Warburg technique), with volumetry, volume changes are measured at constant pressure. For this reason a respirometer must consist of two identical vessels (measurement and compensation vessels) to compensate for variations in air pressure. The vessels are connected via a manometer.

With the Respirometer 65998.00 (Fig. 1), the measuring vessel, compensation vessel and manometer are combined in a Plexiglas block. This compact arrangement simplifies operation, increases the accuracy and prevents damage, because the device is not formed from many separate glass components.

2 OPERATION

The U-shaped manometer on the respirometer is filled with a coloured liquid up to a height of about 3cm using a syringe. The needle should be introduced deeper into the U-tube than the joining hole to the chamber, so that no manometer liquid can enter into the chamber during filling (previously pull off the silicone tube from the tube connections if required). If air bubbles are trapped, then they can be removed by carefully knocking the respirometer.

The two troughs are taken out of the vessels and each filled with 10ml of 47% potassium hydroxide solution. Take care: Potassium hydroxide solution is very corrosive; use a pipette ball! Strips of filter paper are laid in the troughs with potassium hydroxide solution to improve the carbon dioxide absorption. When lowering the troughs in the vessels again and when then working with the respirometer, it should be ensured that the perforated cover plates are not wetted with potassium hydroxide solution, otherwise the experimental animals will be burned.

A strong needle, to which a graduated 1ml plastic syringe is fitted, is pushed through one of the rubber stoppers. The syringe is drawn out to the 1ml mark. The two rubber toppers are lightly greased with stopcock grease. The two pieces of silicone tube attached to the tube connections are fitted with a large pinch clamp (Fig. 1), but are not yet clamped.

The test objects (e.g. 5 weighed meal worms) are put into one of the two vessels – the measuring chamber. Approximately the same volume of glass beads are placed in the other vessel – the compensation vessel. The measuring chamber is closed gas tight with the aid of the rubber stopper and the inserted syringe. The compensation vessel is closed with the other stopper. Then the respirometer is carefully placed in a water bath at room temperature and secured in the upright position with stand support components (Fig. 2). The two silicon tubes are closed simultaneously with the aid of the pinch clamp after a stabilisation period of 10 minutes.

The respirometer is now ready for measurements. In the measuring chamber the oxygen consumption in conjunction with the carbon dioxide absorption leads to increasing underpressure. The air in the compensation vessel can expand and gradually forces the manometer column in the direction of the measurement vessel. Every 5 minutes the syringe plunger is pushed further in until the manometer meniscuses are at the same height again. The oxygen used in each 5 minute period is read off in millimetres on the syringe graduations. The measurements are terminated after an hour and the vessels ventilated by carefully opening the pinch clamp. Then the rubber stoppers can be removed and the animals taken out of the measurement equipment.

After a rest period of at least one hour the experiment can be repeated at a 10 °C higher bath temperature on the same test objects (to determine the Q_{10} value).

3 EXPERIMENTAL LITERATURE

Laboratory Experiments Physiology	16500.02

4 LIST OF EQUIPMENT

Respirometer	65998.00
Bath for Thermostat	08487.02
Immersion Thermostat, 100 °C	46994.93
Glass Beads, *d* = 6mm, 850 PCS	36756.25
Stopcock Grease, 50g	38864.00