

**P 1.1.2**

**Determining volume and density**

- P 1.1.2.1 Determining the volume and density of solids
- P 1.1.2.2 Determining the density of liquids using the Mohr density balance
- P 1.1.2.3 Determining the density of liquids using the pycnometer after Gay-Lussac
- P 1.1.2.4 Determining the density of air



Determining the density of air (P 1.1.2.4)

Depending on the respective aggregate state of a homogeneous substance, various methods are used to determine its density

$$\rho = \frac{m}{V}$$

*m*: mass, *V*: volume

The mass and volume of the substance are usually measured separately.

To determine the density of solid bodies, a weighing is combined with a volume measurement. The volumes of the bodies are determined from the volumes of liquid which they displace from an overflow vessel. In the first experiment, this principle is tested using regular bodies for which the volumes can be easily calculated from their linear dimensions.

To determine the density of liquids, the Mohr density balance is used in the second experiment, and the pycnometer after Gay-Lussac is used in the third experiment. In both cases, the measuring task is to determine the densities of water-ethanol mixtures. The Mohr density balance determines the density from the buoyancy of a body of known volume in the test liquid. The pycnometer is a pear-shaped bottle in which the liquid to be investigated is filled for weighing. The volume capacity of the pycnometer is determined by weighing with a liquid of known density (e.g. water).

In the final experiment, the density of air is determined using a sphere of known volume with two stop-cocks. The weight of the enclosed air is determined by finding the difference between the overall weight of the air-filled sphere and the empty weight of the evacuated sphere.

Cat. No.	Description	P 1.1.2.1	P 1.1.2.2	P 1.1.2.3	P 1.1.2.4
361 44	Glass cylinder with 3 tubes	1			
665 754	Graduated cylinder, 100 ml : 1		2	2	
665 755	Graduated cylinder, 250 ml : 2	1			
590 06	Plastic beaker, 1000 ml	1			
300 76	Laboratory stand II	1			
311 54	Precision vernier callipers	1			
315 05	School and laboratory balance 311, 311 g	1		1	1
316 07	Density balance (Mohr Westphal)		1		
361 63	Set of 2 cubes and 1 ball	1			
590 33	Set of 2 gauge blocks	1			
666 145	Pycnometer, 50 ml			1	
382 21	Stirring thermometer, -30 to +110 °C			1	
379 07	Sphere with two cocks				1
667 072	Supporting ring for round-bottom flask, 250 ml				1
375 58	Hand vacuum and pressure pump				1
309 42	Colouring, red, water soluble	1			
671 9720	Ethanol, fully denaturated, 1 l		1	1	
309 48	Cord, 10 m	1			



Determining the density of liquids using the Mohr density balance (P 1.1.2.2)