

Relative density of urine/determination

Relative density of urine can be determined using a urinometer, refractometer or diagnostic strips.

Urinometer

A urinometer is a simple device for determining the density of urine. It is a suitably calibrated hydrometer, i.e. actually a special float made so that the depth of immersion corresponds to the density of the liquid. Commonly used urinometers are calibrated to a temperature of 15 °C, as this temperature approximately corresponds to the temperature of urine standing for 1 hour in the cold. If we measure the density at a different temperature, the values must be corrected. For every 3°C above the calibrated temperature, 0.001 is added and vice versa. A larger volume of urine (10-15 ml) is required for the examination.

Refractometer

The refractometer determines the density optically based on the refractive index measurement. It has some advantages over the urinometer. 1-2 drops of urine are sufficient for examination. No correction for temperature is required.

Diagnostic strips

By the relative density of urine we mean the ratio of the density of urine and the density of water. The density of water is practically equal to 1 kg/l, so the difference between the density of water (in kg/l) and the relative density of urine is negligible. In the SI system, density has the dimension $\text{kg}\cdot\text{m}^{-3}$. The density of the sample in relation to the density of water is a relative quantity and is therefore given by a dimensionless number.

Determination of urine density

The density of urine is estimated indirectly by the concentration of cations using diagnostic strips. The indicator zone of the strip contains a suitable polyelectrolyte as an ion exchanger and the acid-base indicator bromothymol blue. The principle of diagnostic strips is based on the exchange of cations from urine, especially Na^+ , K^+ , NH_4^+ , for H^+ ions of the polyelectrolyte in the indicator zone. The released H^+ acidifies the weakly buffered acid-base indicator, which is in alkaline form. Acidification is accompanied by a change in color to bromothymol blue. The disadvantage is that examination with diagnostic strips does not take into account substances of a non-electrolyte nature such as glucose, proteins, urea, creatinine and some others.