C3.4.3
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY (NMR SPECTROSCOPY)

C3.4.3.1
Nuclear magnetic resonance (NMR) on water, polystyrene, glycerine and Teflon

Nuclear magnetic resonance (NMR) on water, polystyrene, glycerine and Teflon (C3.4.3.1)

Cat. No.	Description	C3.4.3.1
514 602	NMR supply unit	1
514 606	NMR probe	1
562 11	U-core with yoke	1
562 131	Coil, 480 turns, 10 A	2
521 546	DC Power Supply 0...16 V/0...5 A	1
575 304	Digital storage oscilloscope 70 MHz two-channel	1
501 02	BNC cable, 1 m	2
524 005W	Mobile-CASSY 2 WiFi	1*
524 0381	Combi B sensor S	1*
501 11	Extension cable, 15 pin	1*
500 621	Safety connecting lead 50 cm, red	1
500 641	Safety connecting lead, 100 cm, red	1
500 642	Safety connecting lead, 100 cm, blue	1

* additionally recommended

In a magnetic field B, the magnetic moment of a nucleus associated with nuclear spin I takes on the following energy states:

$$E_m = -g_I \cdot \mu_K \cdot m \cdot B \quad \text{with} \quad m = -I,\ -I+1,\ \ldots,\ I$$

$\mu_K = 5.051 \cdot 10^{-27} \frac{J}{T}$: nuclear magneton

g_I: g factor of nucleus

A high-frequency magnetic field with frequency f projected perpendicular to that magnetic field excites transitions between neighbouring energy states when they meet the resonance conditions:

$$h \cdot \nu = E_{m+1} - E_m$$

h: Planck's constant

This phenomenon is the basis for nuclear magnetic resonance (NMR). Nuclei with an uneven number of protons are active here. The exact resonance frequency of a nucleus depends on the type of the atom and on its chemical surroundings. Along with the outer magnetic field B, a local, inner field also affects every nucleus. This is generated by the nuclei in the immediate proximity. In this way, NMR is useful for analyzing structures.

In experiment C3.4.3.1, nuclear magnetic resonance is demonstrated on polystyrene, glycerine and Teflon. The position, width and intensity of the resonance lines are evaluated.