UNITED SCIENTIFIC SUPPLIES, INC.

Nuclear Magnetic Resonance Apparatus

- **Demonstrate the basic phenomena of nuclear magnetic resonance**
- **Measure the nuclear magnetic moments of hydrogen and fluorine**
- **Determine gyromagnetic ratios**

The NMR Apparatus is a set of equipment for introducing students to the basic phenomena of nuclear magnetic resonance using the CW (continuous wave) technique. It allows the hydrogen proton resonance to be observed in six different chemical environments. A fluoride sample also permits the fluorine resonance to be observed and compared to the hydrogen values.

Further investigations allow the nuclear magnetic moments of the hydrogen proton and the fluorine nucleus to be measured and the use of NMR for the precise determination of magnetic fields to be demonstrated. If a gaussmeter is available, values for the gyromagnetic ratios of hydrogen and fluorine can be independently determined.

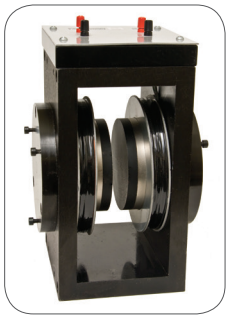
The apparatus set includes a large permanent magnet with flat pole pieces and soft iron pads. The field strength at the center of the gap is about 0.5T. The exact value is marked on each unit. Helmholtz coils surround the pole pieces. A scan control unit supplies an adjustable ac signal to the Helmholtz coils to scan the "fixed" magnetic field over a narrow range.

The samples, contained in small plastic vials, are placed inside the coil of an RF boundary oscillator. The coil is mounted in the end of a long shielded tube positioned at the center of the permanent magnet's air gap.

An oscillator control unit carries coarse and fine frequency adjustments and produces an RF signal of very high frequency stability which is measured by an included frequency counter. At a certain RF frequency determined by the nuclear species present in the sample and the strength of the fixed magnetic field, the magnetic moments of the nuclei in the sample resonate with the fields and absorb energy from the RF oscillator by quantum transitions of the nuclear magnetic moment. This causes a large change of the oscillator's amplitude, which can be observed on a user-supplied oscilloscope.

Five aqueous samples are included; copper sulfate, ferric chloride, hydrofluoric acid, pure water, and manganese sulfate. A glycerin sample is also provided.

Item No.	Description
NMRA01	Nuclear Magnetic Resonance Apparatus



The permanent magnet generates a homogeneous field of approximately 0.5 T and is equipped with a pair of 300-turn scan coils in approximate Helmholtz arrangement.

The oscillator control unit carries coarse and fine frequency adjustments and produces an RF signal of very high frequency stability.

The scan control unit supplies an adjustable AC signal to the Helmholtz coils to scan the fixed magnetic field through a narrow range.

Specifications

Magnet module: Permanent magnet with flat soft iron pole pads, air gap 16.5mm
Field strength: Approximately 0.5 T, exact value marked on magnet
Field uniformity: Better than 0.1% over central region
Scan coils: Helmholtz arrangement, 300 turns each, 0.15mA—200mA
Dimensions: 18 x 15 x 26cm
Weight: 24.7 kg

Scan Control Unit: Provides power to the scan coils and oscillator unit, provides scan output to the oscilloscope with amplitude and phase adjustment.
Scan frequency: 60 Hz. Oscilloscope output: Amplitude 0—19Vp-p Phase adjustment ±90°.
Power: 115 VAC/60 Hz
Dimensions: 24.5 x 12 x 20cm
Weight: 2.3 kg

Oscillator Unit: RF boundary oscillator with probe coil, range 15.8 MHz—24.6 MHz
Dimensions: 24.5 x 21 x 10.5cm

Weights: Oscillator unit: 2.3 kg, probe: 113 g

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